LOGY DEPT.

April, 1946

-FOUNDRY—

wherever metals are cast...

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DETROIT

...active working conditions start
...dust and fume-free air at pour-
...and mold cooling stations, shake-
...s, sand conditioning systems,
...nders, cleaning equipment and
...her dust-creating operations.

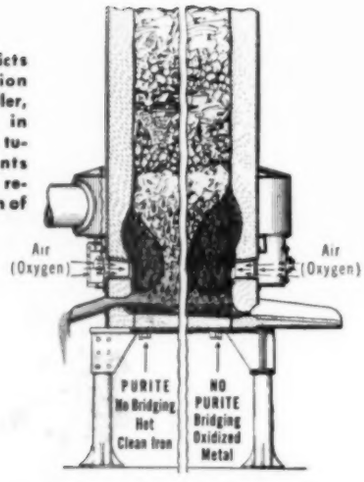
...Schneible Multi-Wash dust, fume
...d odor control equipment has im-
...roved employee-management rela-
...ions in hundreds of foundries. Get
...he story of this trouble-free, original
...wet method dust control system
...which requires no attention other
...han starting and stopping. Catalog
310 gives complete details.

AUDE B. SCHNEIBLE CO.
282[illegible] 25th St., Detroit 16, Mich.

SCHNEIBLE
Dust, fume and odor control equipment

SPEED PRODUCTION OF SOUNDER CASTINGS

PURITE restricts the combustion zone to a smaller, hotter area in front of the tuyeres, prevents bridging and reduces oxidation of the metal.



Purite is used with limestone in the ratio of 1 part Purite to 10 parts stone on the bed coke and 1 part to 20—40 parts stone on regular coke charges.

To insure sounder, better machining castings, use Purite

Refining with Purite, whether in the cupola or in a mixer ladle, purges the molten metal of oxides and silicates which produce sluggish iron, shrinkage and segregation defects.

Purite pays dividends in better cupola operations and cleaner stronger castings.

Can you afford to overlook this means of improving your competitive position in the castings industry.

THE SCIENTIFIC FLUX FOR BETTER MELTING AND CLEANER IRON

PURITE

THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42nd STREET, NEW YORK 17, N. Y.
(Licensee of Metallurgical Development Company, Inc.)
In Canada: Railway & Power Engineering Corporation, Limited

And when it's Omega tool steel, it won't quit or whimper. Omega's a steel that is made specifically to withstand drastic and repeated impact at normal temperatures. It has very high shock-resistance and is therefore recommended for hand chisels, pneumatic chisels, core breakers, and similar applications.

Maybe you make up your own chisels. Maybe you buy them already made. In either case, it will pay to insist upon Omega. For in addition to its shock-resisting properties, this tough steel also holds its cutting edge; doesn't get dull in a hurry; redresses and heat-treats easily.

Give it a trial—as rough as you want. You'll like the way it cleans up castings, breaks out cores.

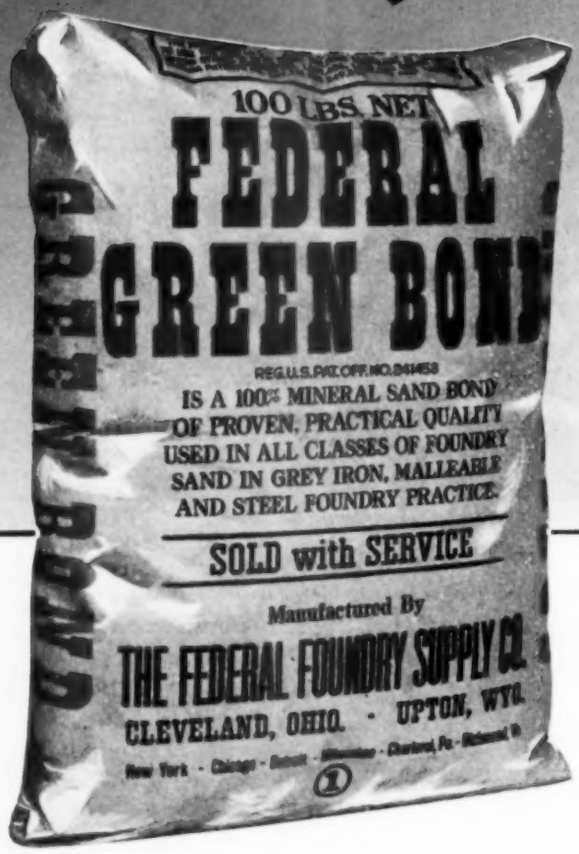
For more information request Data Book 143, Sec. G-1.

BETHLEHEM STEEL

OMEGA... one of Bethlehem's BIG 8 Tool Steels

GREEN BOND BENTONITE...

AS CONSTANT AS THE *Sands of Time*



THE high quality of Federal Green Bond Bentonite is as indestructible as time itself. Green Bond, the best of the bentonites, offers the foundryman a constant, never-changing mix in any quantity he may desire. Federal Green Bond, made from scientifically processed Wyoming bentonite, controls sand strength thus aiding in efficient and economical casting production.

SOMETHING TO INTEREST YOU! . . . SEE US AT THE SHOW . . . BOOTH No. 812

THE FEDERAL FOUNDRY SUPPLY COMPA

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, W

The Foundry Supply Co., Inc., 2295 University Ave., St. Paul 4, Minn. • Beaumont Cement Sales Co., Houston and Beaumont, Texas, and Harvey, La. • Chamberlain Company, Los Angeles, C
Pacific Graphite Works, Oakland, Calif. • LaGrand Industrial Supply Co., Portland, Ore.
IN CANADA—Shenahan's Ltd., Vancouver, B. C. • T. D. Barnes, 59 Sun Life Bldg., Hamilton, Ont. • Chamberlain Engineering (Canada) Ltd., 643 St. Paul St. W., Montreal, Que.
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THE FOUNDRY—

for APRIL 1946

VOLUME 74 NUMBER 4

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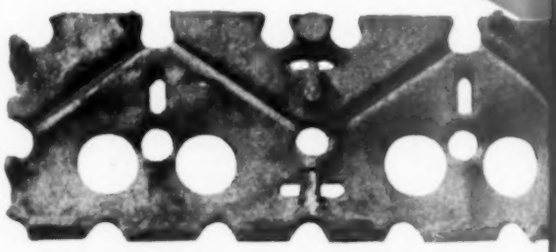
SAY

G &

"PRECISION Castings need precision cores. As the G & C Foundry has always specialized in quality castings it is natural that they have consistently used Linoil during their 30 years in business. The perfection of Linoil and Linoil's exact uniformity make it the logical oil for precision work. High binding strength means less oil—less oil to stick to core boxes, less oil to dry, less gas production in the molds, more perfect finish, more rapid knock out. All these qualities are essential in making precision castings—and the same qualities mean true economy in making any type of castings. Picture of the G & C core room was taken two minutes after the whistle blew. Punctilious housekeeping is an outstanding characteristic of G & C foundry and core room.

Water-jacketed cylinder head for Hercules Motor.



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THE WERNER G.

(DIVISION OF ARCHER

2191 WEST 110 STREET WOODBINE

LINOIL·IS·TOPS

UGHT TO KNOW BECAUSE
& C HAS USED LINOIL FOR
30 YEARS •

"We try them all to be sure we are right; but, the first thirty years have turned up nothing better than Linoil—for us."

so says President J. E. Carroll

LINOIL

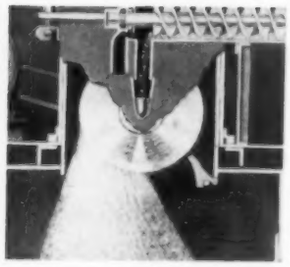
il cores used in cision castings hydraulic and ssure pumps, nder blocks, etc.

SMITH COMPANY

DANIELS - MIDLAND COMPANY)

4690 CLEVELAND 2, OHIO

Bombardment shatters cost of cleaning



Blast Cleaning with ROTOBLAST* Reduces Costs 50-80%

Pangborn ROTOBLAST Cleans Car Wheels quicker, at lower cost, for:

American Car & Foundry Co.
Chicago, St. Louis, Huntington, W. Va.

American Brake Shoe & Foundry Company
Houston, Texas, Rochester, N. Y.

Mt. Vernon Car Company
Mt. Vernon, Ill.

Maryland Car Wheel Company
Baltimore, Maryland

Canadian Pacific Railroad
Montreal

In addition to saving in man-power, the Pangborn ROTOBLAST Unit also assures:

1—Saving in time

2—Saving in breakage

3—Uniformly cleaned castings — silver bright

4—Faster machining

5—Less "sand and scale" wear on cutting tools

6—Simplified inspection

Blast Cleaning with ROTOBLAST Reduces Machine Operating Cost

Those firms which have installed Pangborn Airless ROTOBLAST Cleaning Units (barrels, tables and special machines) benefit from Pangborn developments which provide lower costs for operation and maintenance.

Cost of abrasives is less because of an improved method of feeding onto rotating vanes without the crushing which is inherent with the old combination of revolving impeller and stationary control cage.

Maintenance cost is less because vane replacement — a major item of maintenance — is accomplished easily, just by removing a pin, in contrast to loosening threaded parts which

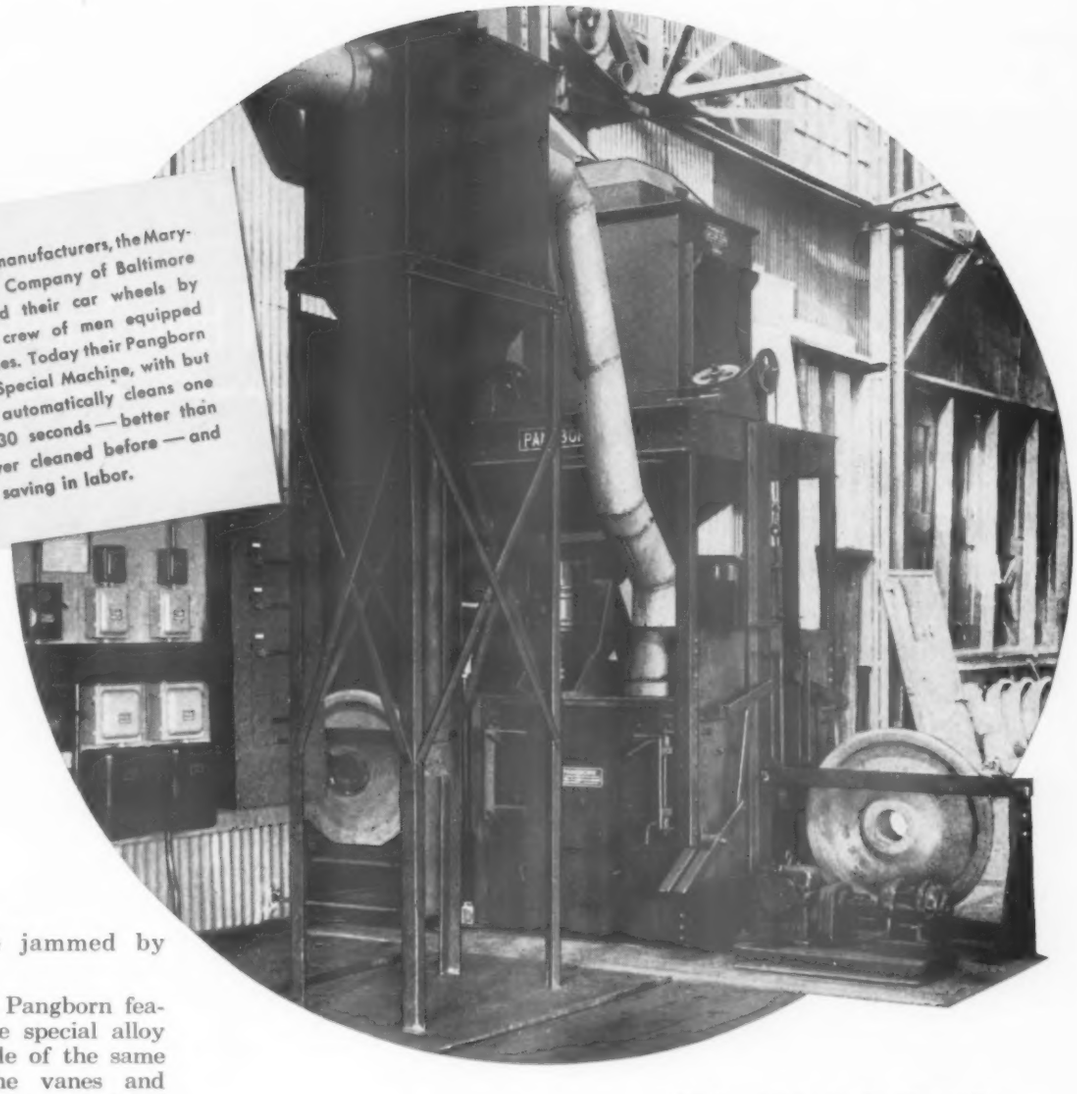
1500-Hour Guarantee Often Exceeded

Pangborn-Norbide† Air Blast Nozzles, guaranteed for 1500 hours service with steel abrasive, have given in actual use as much as 2000 hours before replacement.

Such a service bonus is typical of Pangborn-Norbide nozzles, made with a liner that is the strongest, hardest, most abrasive-resisting substance ever made for commercial use. It reduces air consumption 10–20% compared with iron nozzles, and improves blasting efficiency by maintaining stream contour and abrasive velocity.

†Trademark of Norton Co. for Boron Carbide

As Comfortable As It Is Safe



Like other wheel manufacturers, the Maryland Car Wheel Company of Baltimore formerly cleaned their car wheels by hand, using a crew of men equipped with wire brushes. Today their Pangborn ROTOBLAST* Special Machine, with but one operator, automatically cleans one wheel every 30 seconds — better than they were ever cleaned before — and with a great saving in labor.

may have become jammed by abrasive.

Another exclusive Pangborn feature is the one-piece special alloy vanehead plate, made of the same special alloy as the vanes and promising longer life — up to 3,000 hours depending on the work and the type of abrasive.

Complete information on ROTOBLAST is available by requesting bulletins on ROTOBLAST Rocker Barrels, Tables and Special Machines. Address Pangborn Corporation, Hagerstown, Maryland, *world's largest manufacturer of blast cleaning and dust control equipment.*

*Trademark of the Pangborn Corporation

Pangborn

PANGBORN CORPORATION, HAGERSTOWN, MARYLAND

Pangborn's "DD-4" shoulder-rest Helmet helps men do more work — with less "time out" — because it is the easiest-wearing air-fed helmet made.

Extra-large vision window. Sliding guard. Soft sponge rubber shoulder pads. Ample room inside — does not touch the head, permits wearing glasses. Quickly detachable. Approved by U. S. Bureau of Mines.

Pangborn also offers economical "DF-2" — rubber covered cork headpiece, adjustable head-band. Pangborn Corporation, Hagerstown, Maryland.

Latest Information on Economical Blast Cleaning

Pangborn Corporation, Hagerstown, Maryland

Gentlemen: Please send me free bulletin checked:

ROTOBLAST Barrels, No. 213 ☐ ROTOBLAST Special Machines, No. 2120 ☐ ROTOBLAST Tables, No. 211 ☐ Air Blast Rooms, No. 400 ☐

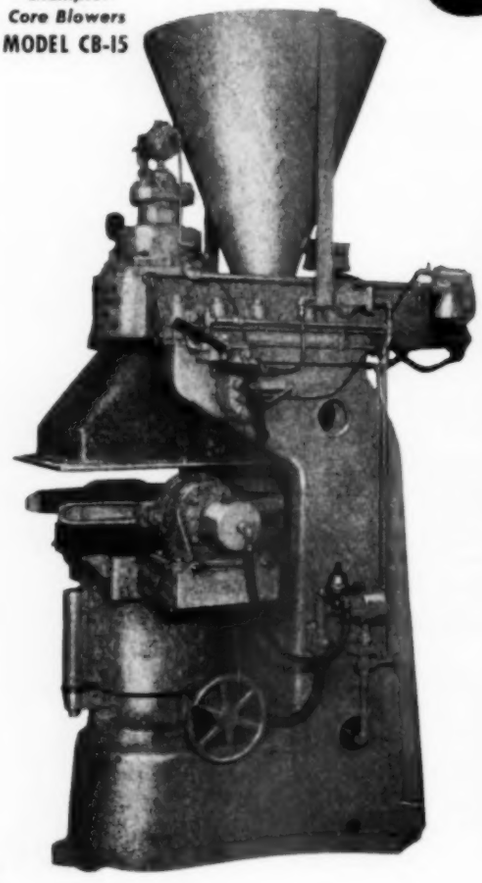
Name ..... Title .....

Company .....

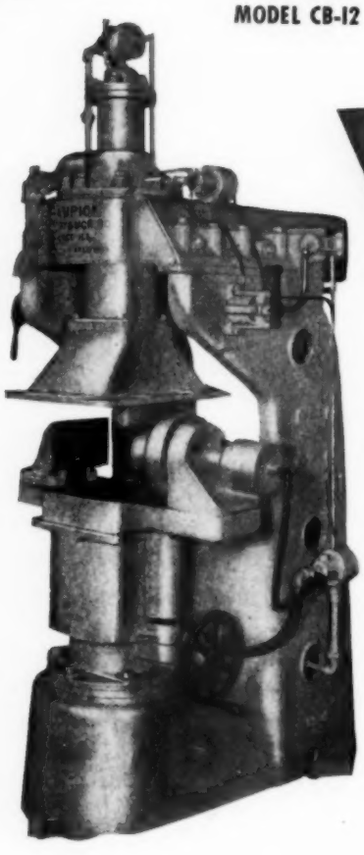
Address .....

FOUNDRYMEN from Coast to Coast are thrilled by CHAMPION "Knowhow"

Champion Core Blowers
MODEL CB-15



Champion Core Blowers
MODEL CB-12



Champion Core Blowers
MODEL CB-8

Performance under the stress and strain of today's demand for accelerated production of perfectly rammed cores is the test of a true Champion—a top-notch tool with the "know how" or "savvy" to remove all guesswork.

That is how a Champion Core Blower performs for the least experienced operator. Any man or woman—boy or girl can produce perfectly rammed cores on a Champion Core Blower by merely setting the box and pulling the lever. In a single second small or large cores are perfectly rammed. The working table is completely accessible with no obstructions, so that cores are produced faster, more economically and more accurately without need for highly trained labor.

A single valve operates the core box clamp, clamps same against the blow plate, blows the core, exhausts and releases the clamps in the proper cycle. Rigid one-piece, cast steel frame insures accurate alignment of core box and blow plate. Patented Air-Operated Hydraulic Clamp locks the core box securely against split box separation.

Champion Core Blowers could be the answer to that most puzzling problem of man-power.

CHAMPION
FOUNDRY & MACHINE CO.
1318 West 21st Street Chicago 8, Illinois

End the SEACOAL *nuisance in your foundry*

DELTA
PERMI-BOND
THE MODERN, SCIENTIFIC SEACOAL REPLACEMENT.

DELTA PERMI-BOND is a new and revolutionary development which eliminates the use of SEA COAL... and its inherent disadvantages... in molding sands.

DELTA PERMI-BOND is a specially prepared pure hydrocarbon, completely volatile at elevated temperatures. It decomposes to form a vapor-gas cushion, which is reducing in nature, and leaves only a trace (two/tenths of 1% maximum) of ash.

NOTE THESE IMPORTANT ADVANTAGES.. and Send For A Liberal Sample. You will also receive complete information on HOW TO USE DELTA PERMI-BOND.

1. Always uniform. Manufactured under rigid chemical and physical control.
2. Eliminates ash and free carbon which contaminate your sand.
3. Greatly reduces gas, smoke, soot and dirt in the foundry.
4. Provides correct amount of vapor gas in the mold cavity, which prevents casting blows and also allows use of lower permeability sand.
5. Increases dry strength of sand 75% to 90%.
6. Prevents scabbing, buckling, rat-tailing and cutting which greatly reduces scrap castings.
7. Improves casting finish, which cuts cleaning room costs to a minimum.
8. More economical to use; reduces your sand costs.
9. Much cleaner and more foolproof to use than sea coal.

DELTA OIL PRODUCTS CO.

Manufacturers of **FOUNDRY PRODUCTS,**
Industrial and Automotive Oils, Greases and Compounds
MILWAUKEE 9, WISCONSIN

Look to WHITING
for your melting needs

The WHITING CUPOLA—over 5,000 built—America's standard iron melter. Also accessory equipment including mechanical chargers, hot blast, balanced blast, moisture control, wet slagging systems, etc.

Regardless of your melting problem, Whiting can supply the equipment best suited to your special requirements.

The recommendations of Whiting Sales Engineers are the result of careful analysis . . . and because of Whiting's complete line, the most suitable medium can be furnished.

Each Whiting unit represents the finest in design and construction, with installations engineered to meet the most exacting metallurgical requirements.

The WHITING CRADLE FURNACE makes possible a continuous supply of metal of uniform composition and temperature. May be pulverized coal-fired, as above, with excellent fuel economy.

The HYDRO-ARC ELECTRIC FURNACE affords accurate positioning of electrodes thru hydraulic power, thus maintaining a steady electric arc and low-cost operation. Installation shown here has latest improved roof-raising mechanism for top charging.

The WHITING AIR FURNACE is frequently combined with the Whiting Cupola in a Duplexing System which makes most efficient use of each unit of equipment and provides a continuous supply of hot metal.

The WHITING SIDE BLOW CONVERTER supplies quality steel at low cost for continuous or intermittent operation. Electronic flame control mechanism makes for dependable operation.

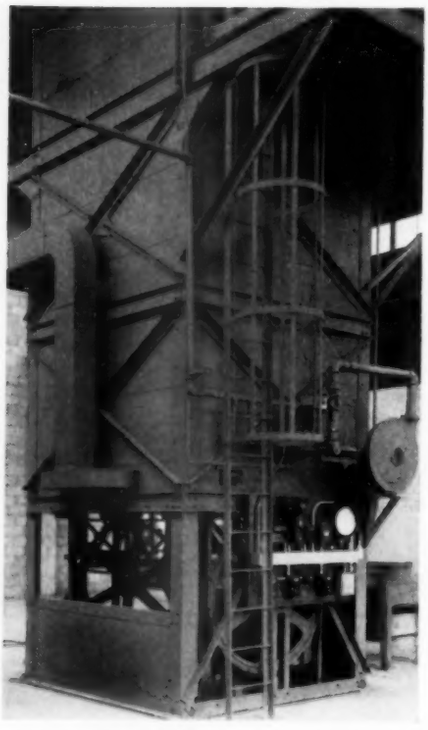
WHITING
CORPORATION
15607 Lathrop Avenue, Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Washington, D. C. Agents in principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 136 Liberty St., New York 6, N.Y.

It's

CARL-MAYER

again and again!



CARL-MAYER VERTICAL CORE OVEN in brass foundry of The H. B. Salter Co., Marysville, Ohio, manufacturers of heating and plumbing fixtures.

Repeat orders from leading foundries, in face of wide competition, is proof of preference for Carl-Mayer Oven design and operation.

Why not take advantage of Carl-Mayer Oven advantages? They will fit in perfectly with your plans for bigger and better production at less labor cost.

Carl-Mayer Core and Mold Ovens are built in the proper type and size to meet your individual requirements.

OVER 25 YEARS' EXPERIENCE

Write for Bulletin showing extensive line of Carl-Mayer Core and Mold Ovens

The Carl-Mayer Corporation
3030 Euclid Ave., Cleveland, Ohio

CARL-MAYER CORE, MOLD OVENS

Announcing the

SCHNEIBLE VELOCITRAP

LOW COST UNIT MINIMIZES WEAR ON DUCTS AND DUST COLLECTORS

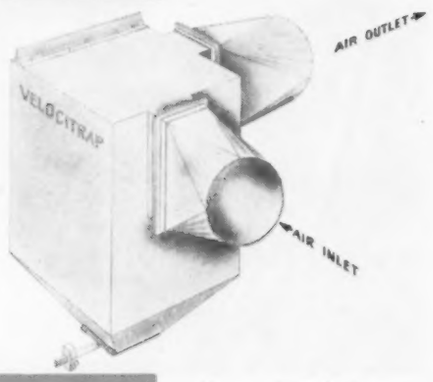
The Velocitrap is a profitable auxiliary to a dust control system where the contaminated air contains a high proportion of heavy, abrasive solids, which tend to wear out the elbows of the ducting. The Velocitrap traps such abrasive materials, removing them from the dust collection system so that they cannot cause wear to ducts, particularly at elbows.

The Velocitrap also greatly decreases the load on the dust collectors, in some cases permitting the use of much smaller collector units. Removing the heavy solids before they reach the collector increases the service life of the collector, improves the efficiency of sludge dewatering equipment, and simplifies disposal of the collected material.

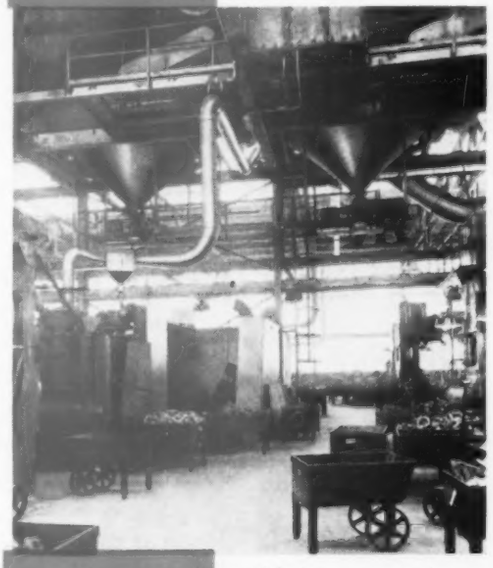
Placed in the intake duct ahead of the collector, the Velocitrap separates solids from the air stream by means of a correctly engineered, slot-shaped opening in an elbow of the duct within the unit. Solid particles are expelled by centrifugal force through the slot and deposited in a hopper. Only a minimum of heavy solids reach the dust collector. A smaller shielded slot, placed opposite the intake slot, re-admits the air into the duct and prevents back pressure.

In foundries the Velocitrap is used to recover abrasives from cleaning operations, and sand from downdraft shakeouts, screens, mullers and sand conditioning systems.

The Velocitrap is substantially constructed, fully automatic, has no moving parts other than the counterbalanced door, requires no maintenance and no attention. Write for Bulletin 246.



View of Velocitrap. Air-borne solids are ejected by centrifugal force, becoming trapped in the hopper of the cabinet.



Velocitrap recovering abrasives from blast cleaning cabinets. Abrasive wear in ducts and dust collector is minimized.

CLAUDE B. SCHNEIBLE CO.

2728 Twenty-Fifth St., Detroit 16, Mich.

Engineering Representatives in Principal Cities

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

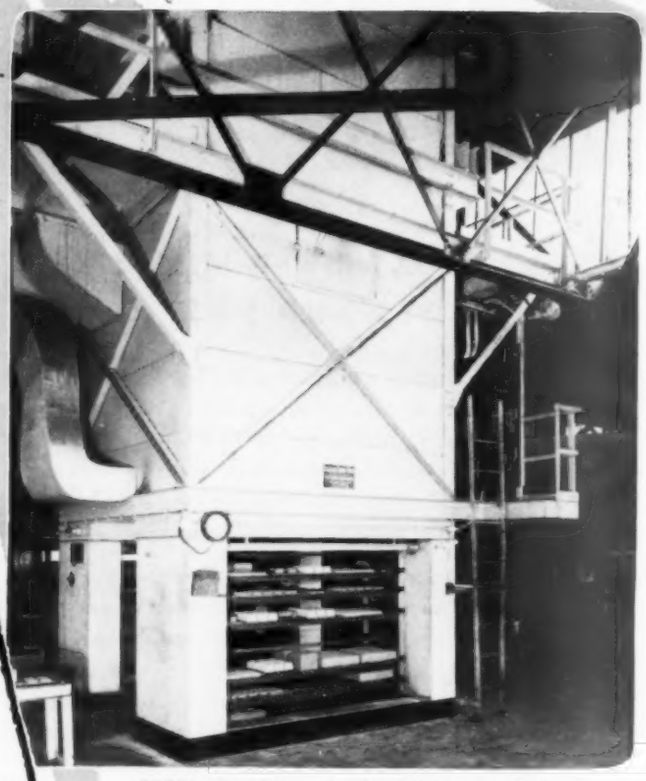
SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION

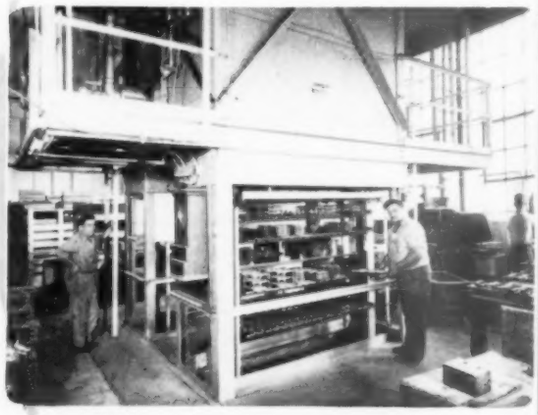
COLEMAN TOWER OVEN

MALLEABLE IRON. One of several Coleman Tower Ovens in leading malleable iron foundry.

GRAY IRON. Core makers grouped around Coleman Tower Oven in gray iron jobbing foundry.



STEEL. Steel foundry installation of Coleman Tower Oven designed for second floor loading and first floor unloading.



BRASS. Coleman Tower Oven in plumber's brass goods and specialty foundry.

COLEMAN CORE and MOLD OVENS

The FOUNDRY EQ
CLEVELAND OHI
BUILDERS OF COLEMA AND

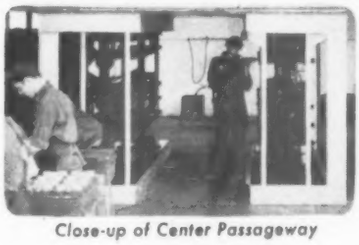
Pay for Themselves in One Year's Operation

Many users have reported direct savings in overall core department operations sufficient to pay for the entire cost of a Coleman Tower Core Oven installation in less than one year's time. Can *you* afford to pass up the opportunity for savings like these?

Some of the features that enable Coleman Tower Ovens to produce such amazing results:

PERFECT BAKING AT AMAZING SPEED. Perfect core baking eliminates rejects and make-overs.

PATENTED CENTER PASSAGEWAY. Permits loading from both inside and outside the Tower. Increases *loading accessibility* by as much as 300% compared with other vertical oven designs.



Close-up of Center Passageway

LARGE LABOR SAVING. The efficient grouping of coremakers and loading and unloading arrangement made possible by the Patented Center Passageway greatly increases production efficiency, also reduces indirect labor to a mere fraction.

RECUPERATIVE COOLING. Cores are cooled before reaching the unloading position and the recovered heat is used over again, resulting in *big fuel saving*.

BETTER WORKING CONDITIONS. With the cores cooled and "smoked-off" before unloading there are no acrid fumes or gases nor uncomfortable heat in the core department. Better conditions increase output.

LARGE OUTPUT FROM SMALL FLOOR SPACE. In Coleman Tower Ovens all the baking is done overhead, giving you large core-baking capacity from practically the same floor space required by a single batch type oven.

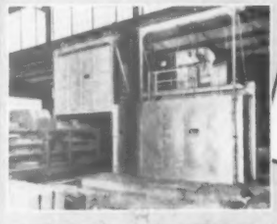
OTHER ADVANTAGES. *These and many other features have been responsible for the wonderful record of performance of Coleman Tower Core Ovens in outstanding foundries producing gray iron, malleable, steel, brass, aluminum and magnesium castings. Coleman Oven Engineers not only pioneered the development of vertical conveyor type core ovens but have gained invaluable know-how in the successful application of this equipment in order to obtain the maximum results for the user.*

Write for Bulletins on complete line of Coleman Core and Mold Ovens.

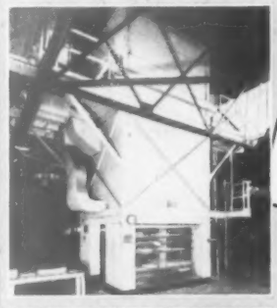
COLEMAN Portable Core Ovens

COLEMAN Rolling Drawer Ovens

COLEMAN Transrack Ovens



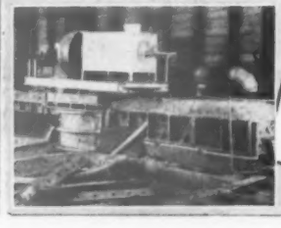
COLEMAN Car Type Ovens



COLEMAN Tower Ovens

COLEMAN Horizontal Conveyor Ovens

COLEMAN Conveyor Mold Ovens



COLEMAN Portable Mold Dryers

EQUIPMENT Company

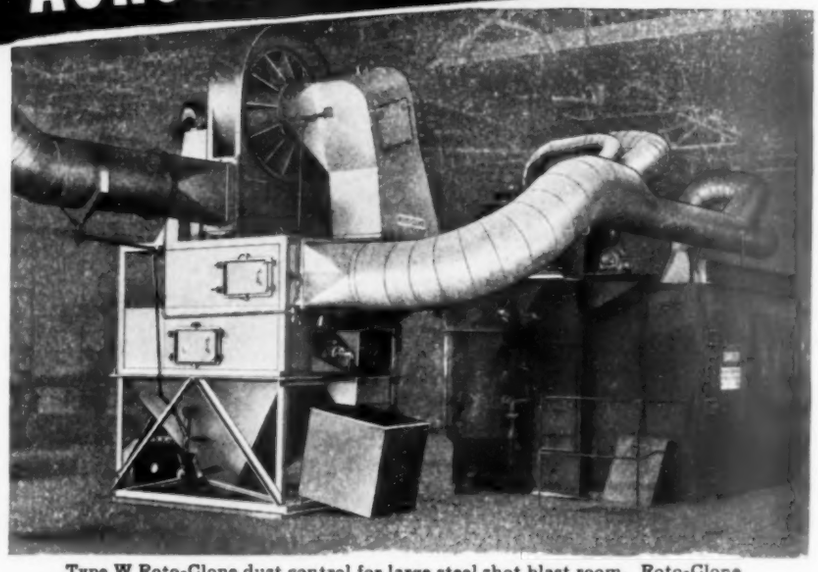
OHIO, U. S. A.

MEMBER FOUNDRY EQUIPMENT MANUFACTURERS INSTITUTE

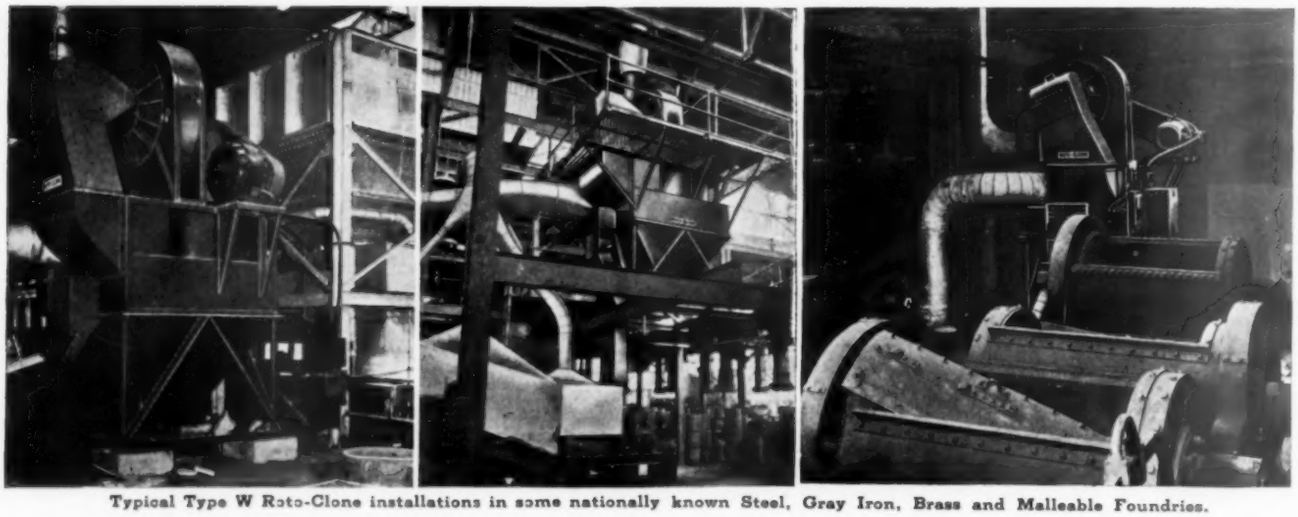
AND SWARTWOUT OVENS

AAF ROTO-CLONES SERVE FOUNDRIES ACROSS THE NATION

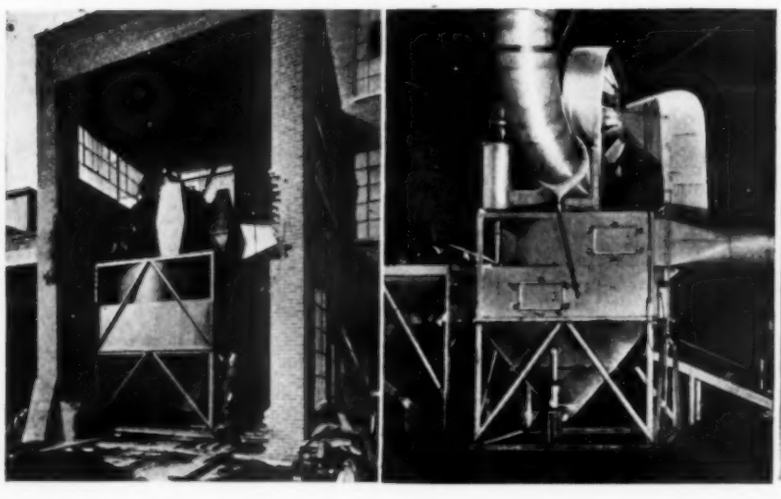
● **DUST PROBLEMS** peculiar to foundry operations have, for many years, been the particular concern of **AAF** engineers. The Type W Roto-Clone, illustrated here in a variety of applications, has become standard practice in the control of shakeout dust, sand conditioning and abrasive cleaning. Bulletins and data sheets on the application of all types of Roto-Clones to foundry dust problems are available on request. Please send for them.



Type W Roto-Clone dust control for large steel shot blast room. Roto-Clone ejector automatically removes collected material as sludge.



Typical Type W Roto-Clone installations in some nationally known Steel, Gray Iron, Brass and Malleable Foundries.



ROTO-CLONE

AAF

AMERICAN AIR FILTER COMPANY, INC.
Incorporated
366 Central Ave., Louisville 8, Kentucky.

it's better iron from HANNA

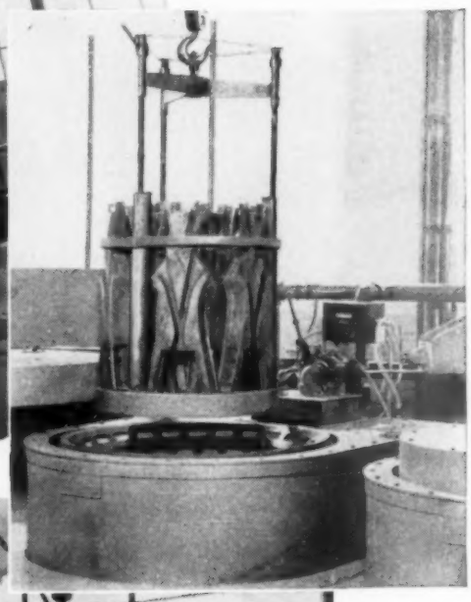
For more than 75 years, Hanna Furnace has worked to provide foundrymen with better iron for better castings. Hanna Furnace is quality-minded . . . has always been willing to experiment and cooperate in the development of new ideas that lead to *more uniform* and *higher quality* castings . . . has made continuous progress in controlling crystal growth to insure finer grain structure, thus contributing to the *strength* of finished castings.

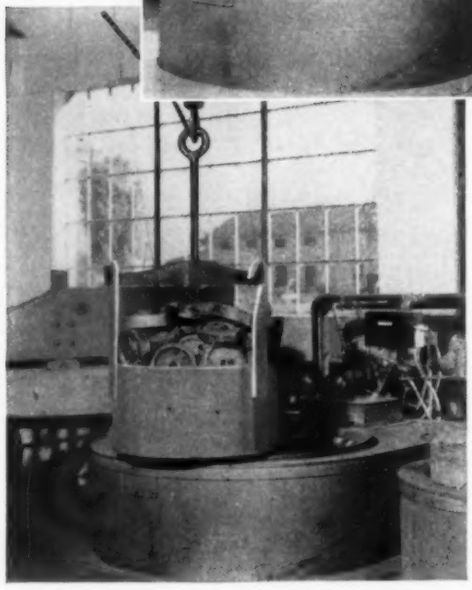
Whether you use the new 10-pound Hanna Ten ingot or the conventional 40-pound pig, you can be sure of best results with Hanna iron. A Hanna metallurgist will be glad to point out the specific advantages of both forms of Hanna iron. Just write or phone your nearest Hanna office.

THE HANNA FURNACE CORPORATION

BUFFALO • DETROIT • NEW YORK • PHILADELPHIA • BOSTON

MERCHANT PIG IRON DIVISION OF NATIONAL STEEL CORPORATION





These big loads

EVENLY HEATED . . . FAST
WITH LINDBERG *Super-Cyclone*

Gate valves, railroad frogs and cast gear blanks, as illustrated . . . and hundreds of other kinds of castings are being quickly and evenly heat treated in many foundries throughout the country with the revolutionary Lindberg Super-Cyclone Furnace.

Utilizing the famous Cyclone principle of driving accurately heated air through the work at high velocity, the Super-Cyclone builds up temperature of the load with rapid uniformity. Distortion due to radiant heat, is eliminated because of this principle.

The use of fixtures enables a single operator to easily handle loads as heavy as six tons, saving time, labor and space.

The Super-Cyclone has an efficient operating temperature range up to 1700° F. and is employed for normalizing, annealing, hardening and tempering. Write for complete information.

LINDBERG ENGINEERING COMPANY
2453 WEST HUBBARD STREET, CHICAGO 12, ILLINOIS

ARMY E NAVY

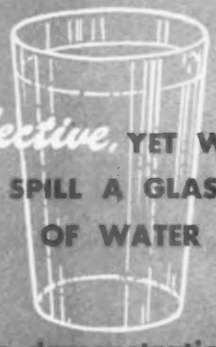
Lindberg FURNACES

SUPER-CYCLONE for hardening, normalizing, annealing, tempering
CYCLONE for accurate, low-cost tempering and nitriding
HYDRYZING for scale-free and decarb-free hardening

SHAKES OUT-NOT APART

Two 47" by 7' grid Royer Shake-Outs with bases connected to form a single unit. Units can be made to suit any arrangement, mounted over a shake-out belt or sand feeder.

THE ROYER WALKING BEAM SHAKE-OUT



Effective, YET WILL NOT SPILL A GLASS OF WATER

See demonstration at A.F.A. Convention, Cleveland, May 6-10.

has conclusively proved that proper design can *completely eliminate* the excessive costs and high maintenance typical of ordinary shake-outs. Installations in many foundries are evidence of these claims.

In operation, only the walking-beam moves; the structure remains stationary. The Royer Shake-Out operates so smoothly that a glass of water standing on the edge of the frame will not spill.

Other exclusive characteristics of the Royer Walking Beam Shake-Out include:

Operates with a fast, positive walking beam action.

Identical action over entire shake-out area—*no dead zones.*

Will not clog or become inoperative under overload.

Flasks, bands, castings, etc., are conveyed (without auxiliary feeder) off one end onto a conveyor or tote box.

Unit has a low horsepower requirement. *No air is employed.*

Operates flat, requires no slope and little space, is easy to ventilate.

Does not damage flasks or castings.

Ruggedly built, with no fragile or rapidly wearing parts.

The Royer Walking Beam Shake-Out is ideal for both jobbing and production foundries making small to medium sized castings. Installations with Royer Combinations show years of service and extremely low maintenance costs. Let one of our sales engineers show you how Royer can end your shake-out troubles.

Royer Sand Conditioners Provide Them!

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

Regular users of Aluminum casting alloys have, through our Members, enjoyed steady supplies of ingot available to their specifications for all casting applications. Result—rising production; no material worries.

Other users, switching to Aluminum castings to replace other materials also find, through us, readily available supplies of Aluminum alloys tailored to fit their needs; plus competent assistance in applying Aluminum castings to their designs. Result—speedier production on their new—and modern—products.

The same skilled assistance can help *you* develop *your* plans and applications. Why not, without obligation, consult any Member?

Aluminum Research Institute

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Three-ton Ajax-Northrup furnace pouring high quality alloy steel into a centrifugal casting machine

MAKING BETTER STEEL *faster*

WITH AJAX-NORTHRUP HIGH FREQUENCY

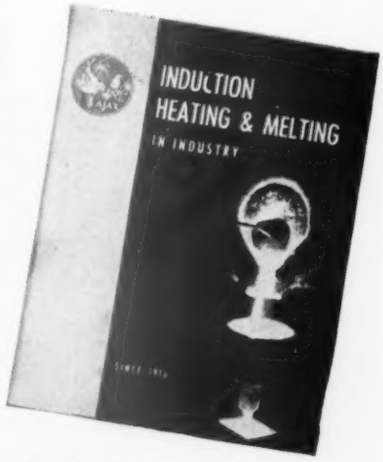
In 24 hours, one 4-ton Ajax-Northrup furnace melts and pours 11 heats or 44 tons of high-grade alloy steell A smaller furnace can melt and pour a heat of 200 lbs. of tool steel every 25 minutes. Every heat will be of exact, clean analysis, with uniform composition and closely controlled pouring temperature.

Melting is carbon-free — there are no electrodes. It is ideal for nickel, chromium and other alloys. Electro-magnetic stirring assures uniform composition.

Melting costs are low — the Ajax-Northrup furnace is generally more efficient than other electric furnaces of corresponding size. Lining life is long. Relining is easy.

Put in Ajax-Northrup furnaces to handle your melting where speed, special alloys, quick change-overs or wide variations in size of melts are required. Most Ajax-Northrup users say "it's the only way." Capacities from 8 oz. to 8 tons, with converter or motor-generator power.

Send for informative Bulletin No. 25



Save on Scrap Recovery

Alloy scrap can easily be reclaimed with low loss in an Ajax-Northrup furnace. It's excellent for scrap having easily oxidizable elements.

86

AJAX NORTHRUP *Since 1916*

AJAX ELECTROTHERMIC CORP., AJAX PARK, TRENTON 5, N. J.

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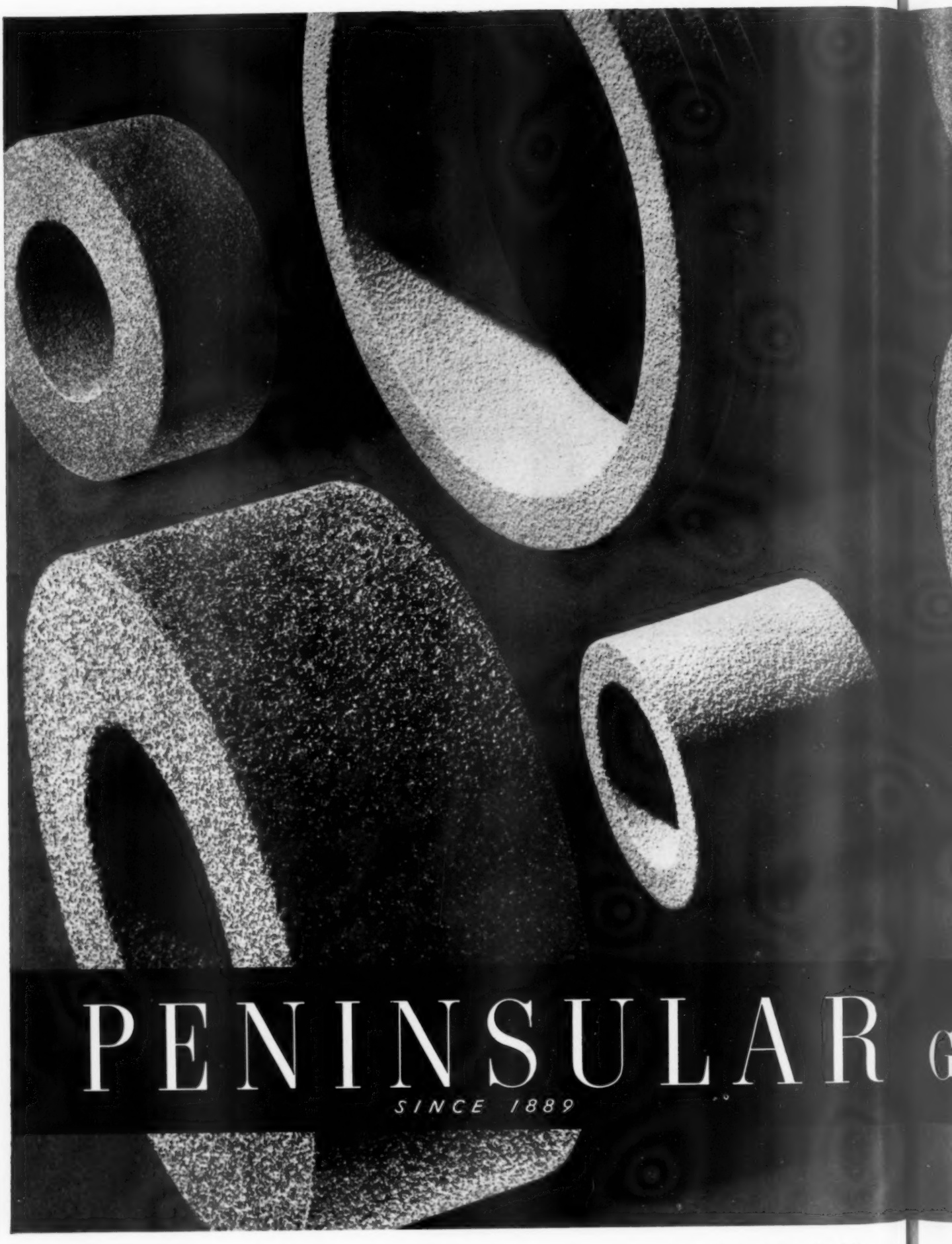
C O M P A N I E S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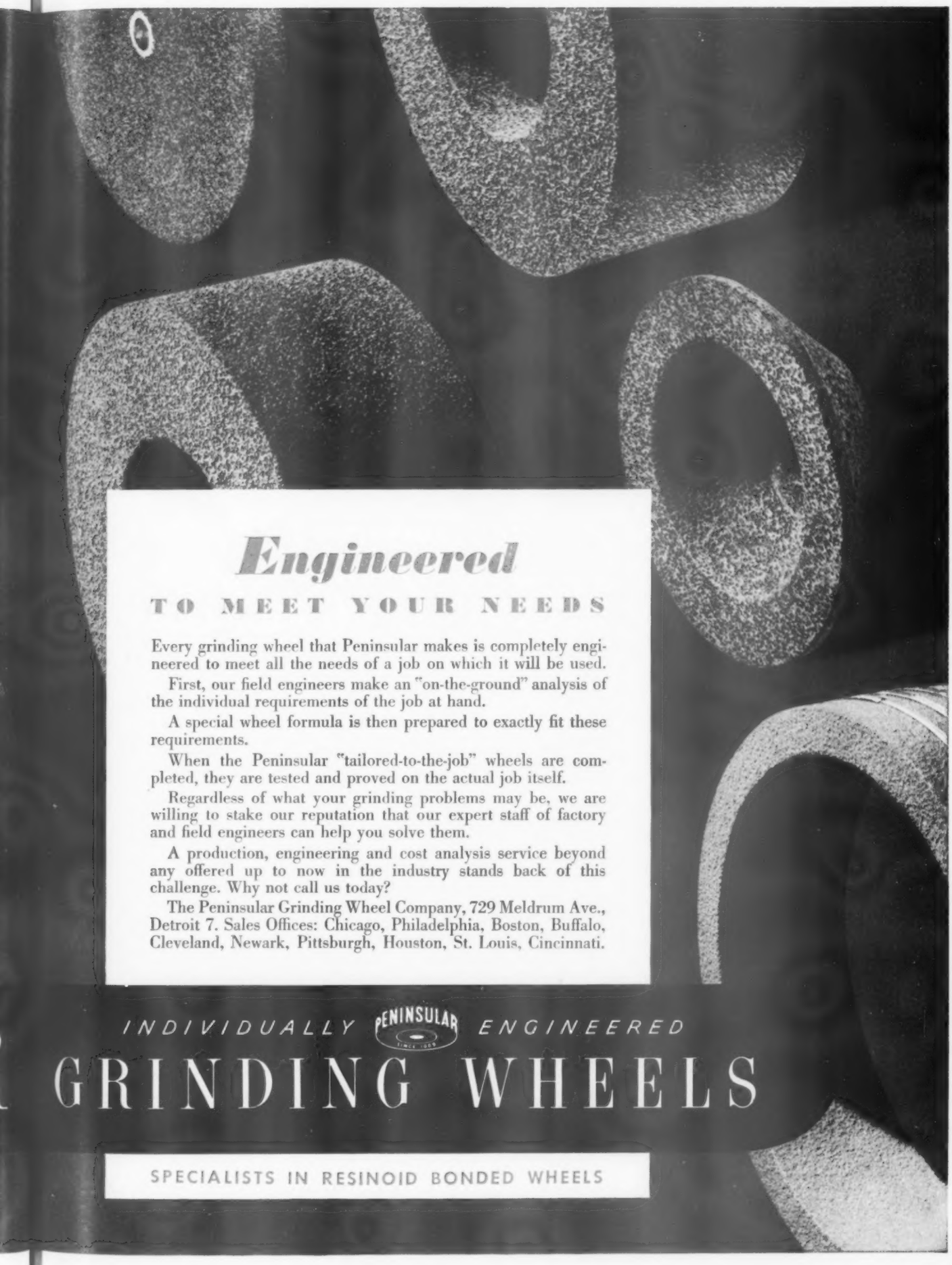
SINCE 1889



Engineered

TO MEET YOUR NEEDS

Every grinding wheel that Peninsular makes is completely engineered to meet all the needs of a job on which it will be used.

First, our field engineers make an "on-the-ground" analysis of the individual requirements of the job at hand.

A special wheel formula is then prepared to exactly fit these requirements.

When the Peninsular "tailored-to-the-job" wheels are completed, they are tested and proved on the actual job itself.

Regardless of what your grinding problems may be, we are willing to stake our reputation that our expert staff of factory and field engineers can help you solve them.

A production, engineering and cost analysis service beyond any offered up to now in the industry stands back of this challenge. Why not call us today?

The Peninsular Grinding Wheel Company, 729 Meldrum Ave., Detroit 7. Sales Offices: Chicago, Philadelphia, Boston, Buffalo, Cleveland, Newark, Pittsburgh, Houston, St. Louis, Cincinnati.

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SPECIALISTS IN RESINOID BONDED WHEELS

EXTREMELY HIGH COMBUSTION TEMPERATURES MEAN

1 *Complete Sulphur Recovery* from steels, including alloy steel, irons, including pig iron, ferro alloys, non-ferrous metals and alloys, slags, ores, coke, etc. by using the New Standard three minute combustion-titration method of sulphur analysis. This method requires a temperature of 2700°F.

2 *More accurate, faster and trouble free volumetric carbon analysis.*

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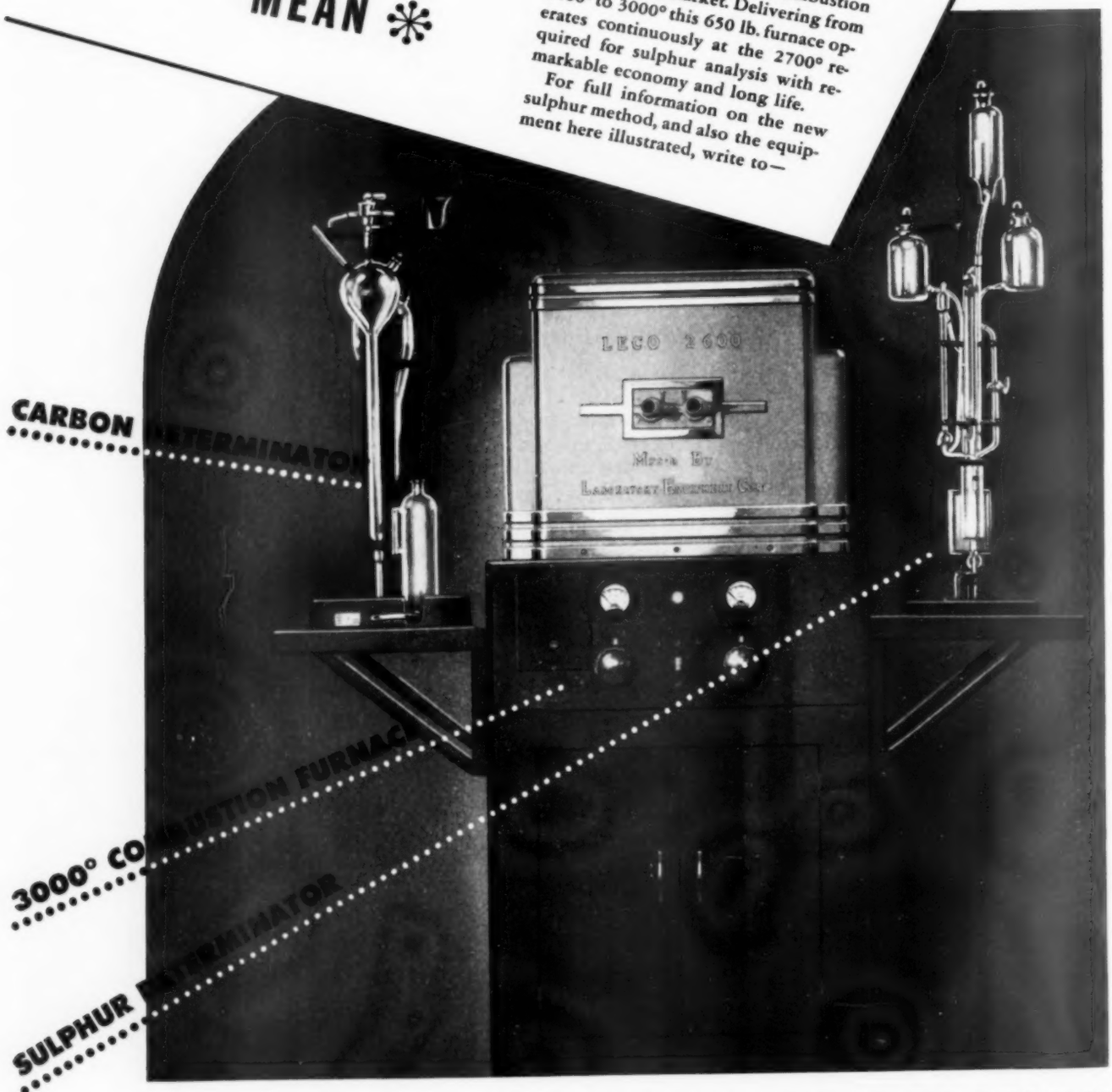
The 3000° Leco Combustion Furnace is the first truly industrial combustion furnace on the market. Delivering from 2400° to 3000° this 650 lb. furnace operates continuously at the 2700° required for sulphur analysis with remarkable economy and long life.

For full information on the new sulphur method, and also the equipment here illustrated, write to—



LABORATORY EQUIPMENT CORPORATION

Benton Harbor, Michigan

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AN *Experienced* FOUNDRY SPECIALIST

He's the Republic Pig Iron Metallurgist, a practical, down-to-earth foundryman, who knows many valuable short-cuts for boosting production efficiency and cutting unit casting costs.

From years of actual experience, he is well acquainted with foundry practice and foundry methods. Yet, he is a skilled metallurgist, trained to know and understand irons, their melting and pouring characteristics, and other details which are essential to insure top quality in finished castings.

If you have a production problem that needs solving, or if you would like to make sure that your foundry is operating at its peak efficiency, do not hesitate to call in the Republic Pig Iron Metallurgist. It will place you under no obligation, whatsoever.

Just let us know when you would like him to visit your plant.

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GENERAL OFFICES • CLEVELAND 1, OHIO
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MID AMERICA EXPOSITION CLEVELAND

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"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

REPUBLIC STEEL

ALSO TRUSCON FOUNDRY FLASKS • REPUBLIC CORE WIRE • FOUNDRY NAILS

DILL, Inc.
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. . . GOES ALL OUT FOR DIAMOND

Originators of

SNAP FLASKS

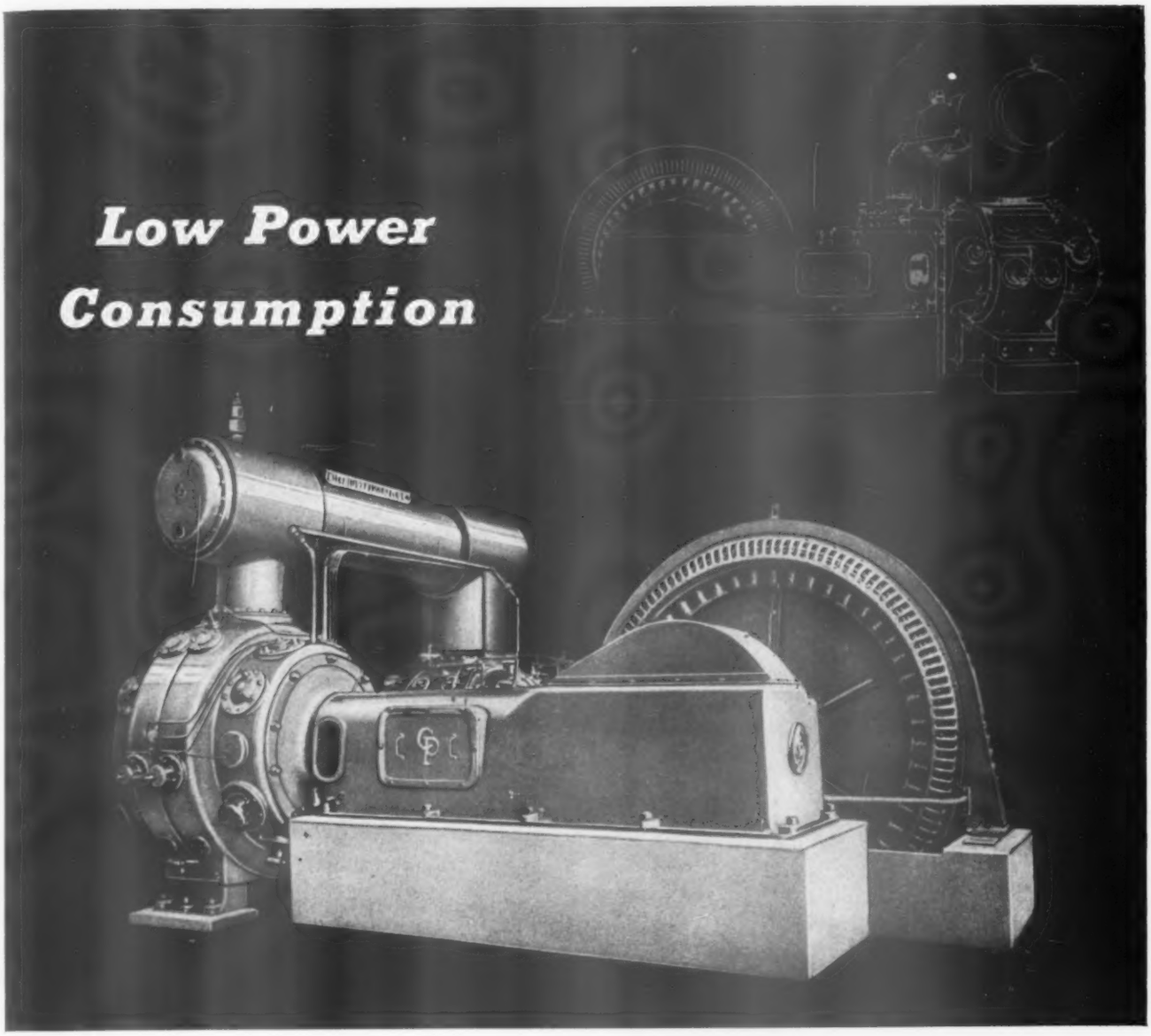
HERE in their new modern daylight foundry they find Diamond Flask Molding Equipment giving them uninterrupted production of fine gray iron castings.

This is typical of a host of other foundries using Diamond Flask Equipment for the past 57 years.

DIAMOND

Telephone 2553 — CLAMP AND FLASK COMPANY — Richmond, Indiana

Designers of CORE PLATES, JACKETS, BANDS, FLASKS *since 1889*



BUILT INTO CP CLASS O-CE COMPRESSOR

THE low power consumption of the heavy-duty Chicago Pneumatic Class O-CE Compressor is the result of large area, durable, quick-acting Simplate valves . . . streamlined air passages . . . multi-step capacity regulation . . . thoroughly effective intercooling and water jacketing and efficient lubrication.

CP Class O-CE Compressor is of the horizontal, double-acting, water-cooled type with direct-mounted synchronous motor drive. Capacities range from 350 c.f.m. to 10,000 c.f.m., 80 pounds to 125 pounds pressure. Other sizes available for lower and higher pressures and for other types of drive. Write for Bulletin 726.

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AIR COMPRESSORS
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● Most metal specifications today require rigid mechanical properties in addition to the chemical composition. The tensile testing machine is an indispensable instrument used in determining properties such as tensile strength, yield strength, compression strength, and elongation of alloys. The use of this machine and other laboratory equipment enables Apex to determine exact specifications and further the research development of aluminum and magnesium alloys. This is one more modern tool of Apex Research Leadership back of every ingot.

APEX SMELTING

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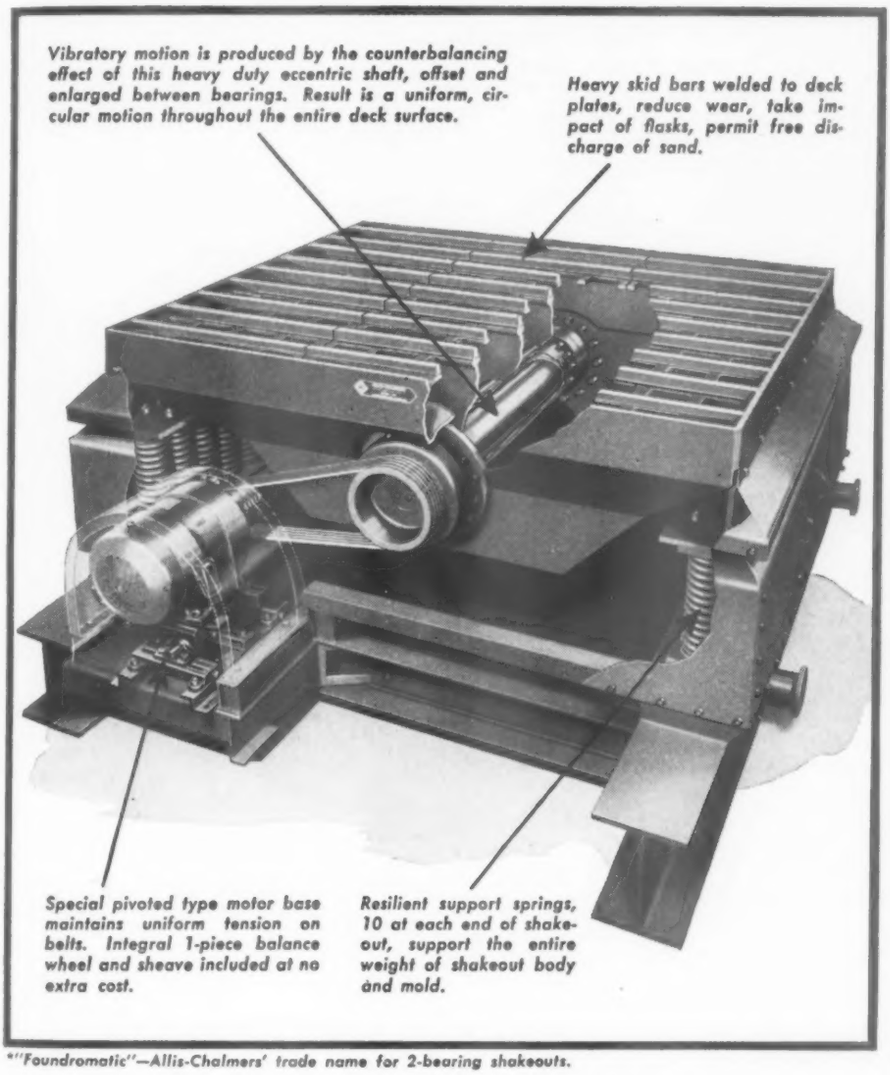
"FOUNDROMATIC"* OPERATION REVEALS IMPORTANT SAVINGS


Vibratory motion is produced by the counterbalancing effect of this heavy duty eccentric shaft, offset and enlarged between bearings. Result is a uniform, circular motion throughout the entire deck surface.
Heavy skid bars welded to deck plates, reduce wear, take impact of flasks, permit free discharge of sand.
Special pivoted type motor base maintains uniform tension on belts. Integral 1-piece balance wheel and sheave included at no extra cost.
Resilient support springs, 10 at each end of shakeout, support the entire weight of shakeout body and mold.

*"Foundromatic"—Allis-Chalmers' trade name for 2-bearing shakeouts.

New, modern, high-speed "Foundromatic" shakeouts reduce operating time from hours down to minutes or seconds over older, less efficient methods. And they not only save time, but increase capacity, reduce flask breakage—handle a wide range of shapes and sizes of flasks and castings! Why not plan, at your convenience, to see "Foundromatic" shakeout in operation at Milwaukee? Make arrangements through our nearby district office, or directly with Allis-Chalmers, Milwaukee.

A1966

New 25 Ton Capacity Single Unit Shakeout Handles 90% of Tonnage Cast in Average Jobbing Foundry, Is Low in First Cost, Maintenance

MILWAUKEE, WIS. — Allis-Chalmers new 2-bearing "Foundromatic," world's most heavily constructed shakeout, is supplanting 4-bearing units on heavy-duty applications and in operations where there is wide range in weights of loads to be handled.

Offered in 8 x 10 ft, 25 ton; 6 x 8 ft, 18 ton; 5 x 8 ft, 12 ton; 5 x 8 ft, 7½ ton; and 4 x 6 ft, 6 ton capacities, the new shakeouts promise important savings. *Lower initial cost*—entire production handled on single unit.

A-C Substations Lowering Arc Furnace Costs

Foundrymen are using Allis-Chalmers complete sub-stations to get extra melts per day from arc furnaces—at lower cost. Economy features are quick-acting "Regulex" electrode control, and low maintenance disconnect switch.

This extra value is typical of A-C equipment for the foundry industry — Screens, Crushers, Hearth Furnaces, Kilns, Motors, Starters, Texrope Drives, Pumps, Blowers, Compressors, Furnace Transformers, etc.

Big capacity — largest of any single mechanical unit. *Reduced* operating cost — *lower* power consumption; *lower* maintenance — only 2 bearings to maintain; and important savings in space.

For complete details, contact our nearby district office, or write for Bulletin B6365. ALLIS-CHALMERS, MILWAUKEE.

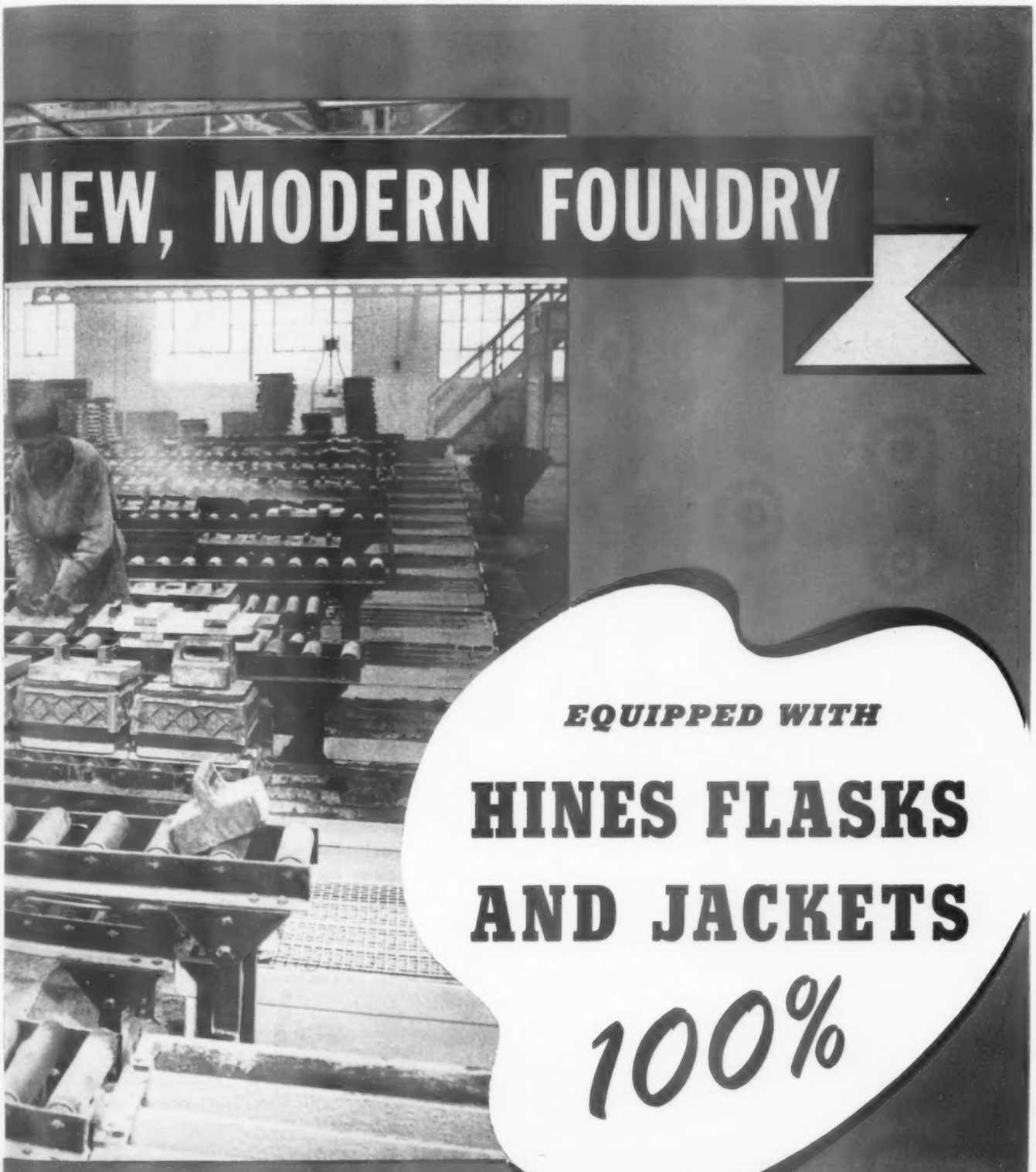
ALLIS-CHALMERS EQUIPMENT FOR THE FOUNDRY INDUSTRY

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*

BUILDERS OF FLASKS AND JACKETS EXCLUSIVELY FOR OVER 25 YEARS

THE HINES

3431 WEST 140th ST.



NEW, MODERN FOUNDRY

EQUIPPED WITH

HINES FLASKS AND JACKETS

100%

FLASK CO.

CLEVELAND 11, OHIO

The TUBE that TRAPS DUST!

EASY

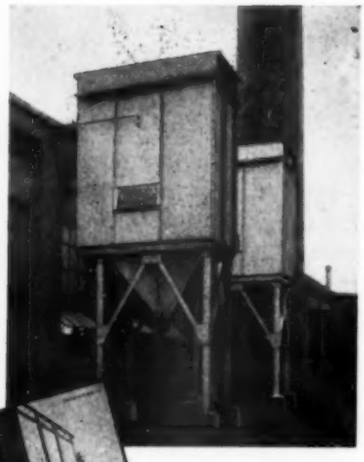
TO INSTALL • TO INSPECT TO REPLACE • TO SHIP and STORE

DUSTUBE Filter Tubes are inexpensive and easy to install and maintain . . . one man can replace a tube quickly and easily without using a single tool. The bottom of the tube is simply inserted in the cell plate and the top is hung on a hook attached to the shaker channel.

Since they are compact and light, tubes are easy to store and ship and do not burden the collector with excess weight. When inspecting the tubes, it is not necessary to disassemble any part of the collector. The operator can view any tube from the walkway.

Tubes are never under tension . . . a factor that adds greatly to service life. Clogging is prevented because the tube openings range from 5″ to 8″ in diameter. Ample spacing of tubes decreases resistance to air flow, saves power, and provides uniform air velocity throughout the Collector.

For other advantages of equal importance to you in efficient, low-cost operation, be sure to investigate DUSTUBES. Write for information and literature today.



DUSTUBES are used by plants like these: Kaiser Industries, Remington Rand, Pratt & Whitney, Dodge-Chicago, National Malleable & Steel Castings Co., Walworth Co., Buick, International Harvester, General Electric, Link-Belt, Bendix, Ford, Wright Aeronautical, Timken Roller Bearing, Kohler, Allis-Chalmers.

Write today for DUSTUBE Catalog No. 72.

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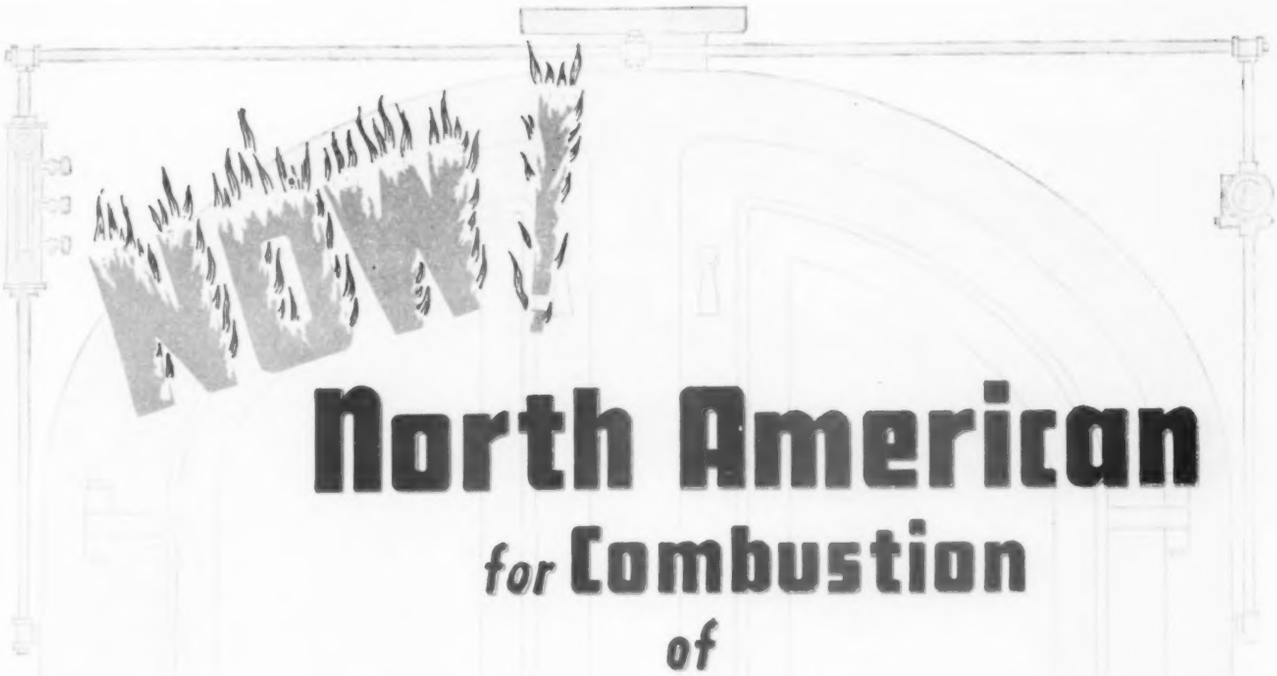
DUST COLLECTORS



North American
for Combustion
of
oil & gas in boilers

Sturdy Industrial Combustion Equipment by North American has always been used for boiler firing upon request.

Now these precision systems are merchandised in complete groups with essential combustion and safety controls for process or heating boilers.

Multiple burners for volumetric turndowns as low as 1/25 — single burners for simplicity — exceptional fuel-air ratio fidelity over entire operating range — easy maintenance — complete safety.

THE NORTH AMERICAN MFG. CO.
CLEVELAND 4, OHIO
GAS OR OIL COMBUSTION EQUIPMENT
BRANCH OFFICES IN PRINCIPAL CITIES

Saved 5000 MAN HOURS IN 4 MONTHS

A remarkable record — but not unusual for the Hough Payloader, was this performance at the Chicago Hardware Foundry Company, North Chicago, Illinois. Handling moulding and core sand, this speedy little loader maintained peak foundry production and output throughout the critical labor shortage — saved 5000 man hours in four months — cut handling costs substantially — paid for itself in labor savings alone. A record so outstanding that now a second unit has gone into action.

If you are interested in effecting substantial economies, in saving labor, in increasing production, get complete details on the two sizes of Hough Payloaders — Today.

Send for Catalog

Complete information on the HA Payloader—mechanical details, operating data, installation photos, in this new catalog.

THE FRANK G. HOUGH CO.

MATERIAL HANDLING EQUIPMENT SINCE 1920

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A reliable name... **IN ALLOYS**

BRONZE INGOTS... from this institution are always uniform in quality—for excellent reasons. They are backed by years of experience and a tradition that permits no compromise with quality. SIPI is more than a trade mark. It is a symbol in alloys—as reliable a name as sterling on silver. The SIPI shield on an ingot is your guarantee that it meets the exacting specifications of industry and that it is the result of tireless research by skilled laboratory and plant technicians.

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CUT PRODUCTION COSTS *with*

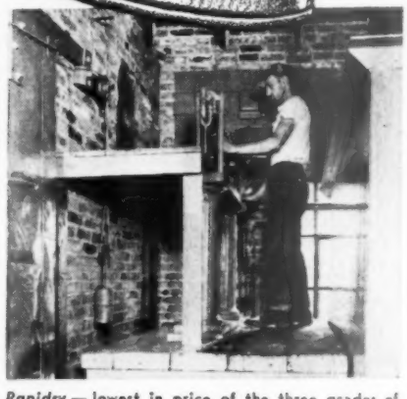
Here are the results which other foundries are obtaining, based on *bona fide* reports — foundries that have tried and subsequently adopted Certified *Rapidry* Core Oil:

- Faster and more uniform mixing with any type of sand.
- Smooth working in the core boxes, resulting in faster production of cores.
- Cores that can be baked in less time or at a lower temperature.
- Smoke and gas reduced to a minimum in the core room and during pouring.
- Time saved in the shake-out, because of readily collapsible cores.

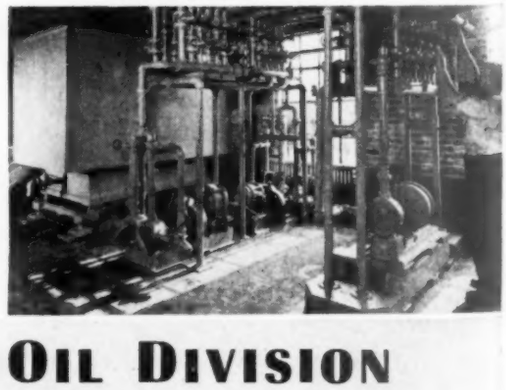
The economies effected by Certified *Rapidry* Core Oil add up to savings which are important in a competitive era.

A trial of *Rapidry* Core Oil will prove to be one of the most profitable experiments ever conducted in your foundry — write today, stating your sand and oven conditions.

Visit our Exhibit at the A.F.A. Convention, Booth 502, near Service Office, Cleveland Auditorium, May 6 to 10.



Rapidry — lowest in price of the three grades of Certified Core Oils — like the other grades, is mixed by weight rather than by volume — the only dependable method of insuring quality and uniformity. Every drop is compounded under close laboratory control.

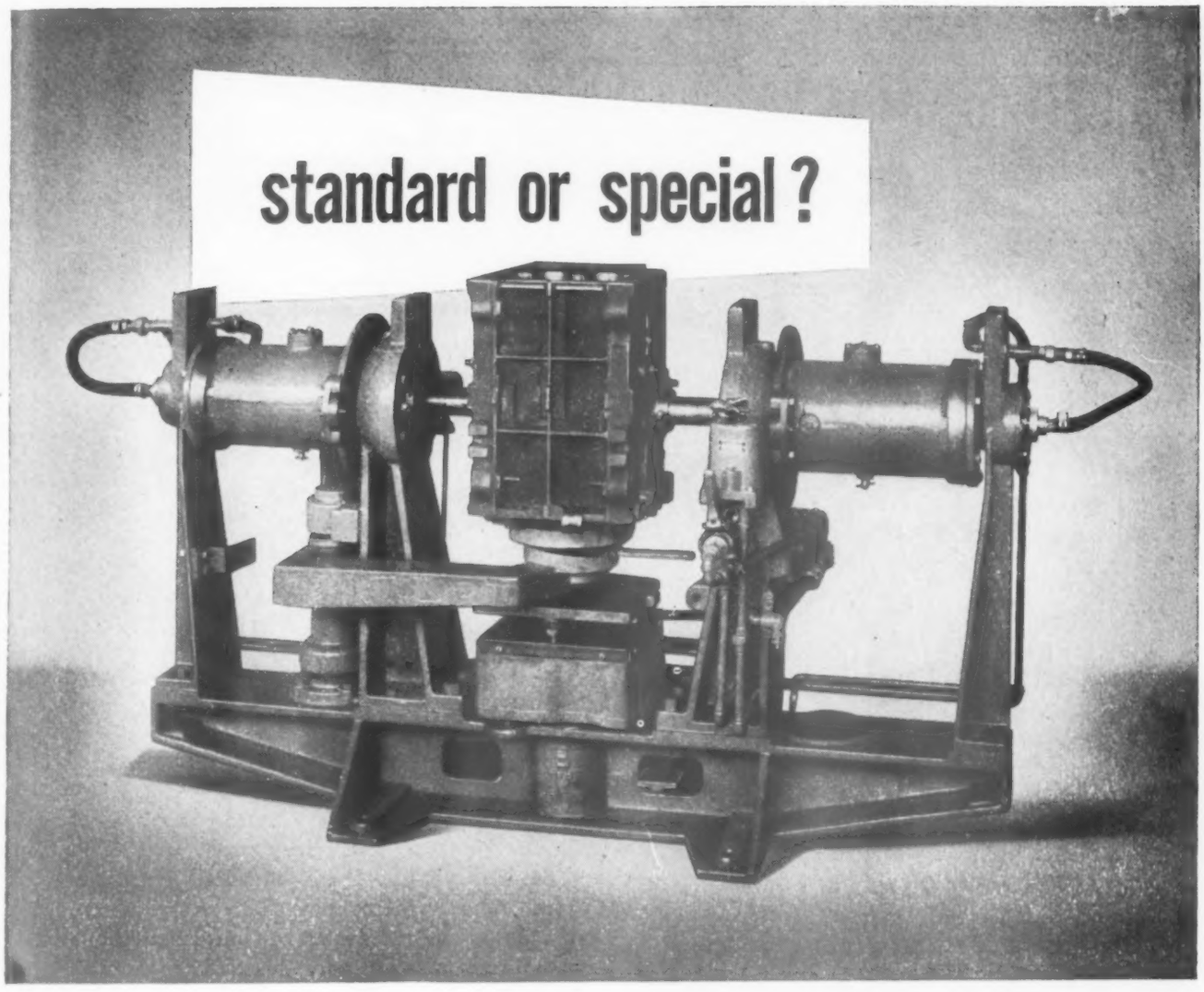


CERTIFIED CORE OIL DIVISION
SOCONY-VACUUM OIL COMPANY, INC.

3308-26 South Cicero Avenue, Cicero, Illinois.

Stock and representatives:

Buffalo, N. Y.; Elmira, N. Y.; Worcester, Mass.; Bloomfield, N. J.; Reading, Pa.; Sunbury, Ohio; Milwaukee, Wisc.; St. Louis, Mo.; Minneapolis, Minn.; Birmingham, Ala.; Houston, Tex.; Denver, Colo.; San Francisco, Calif.; Portland, Ore.



TABOR FOUNDRY MOLDING MACHINES

This core machine for making barrel cores for cylinder blocks was designed by Tabor to specifications of the user; it is one of 40 built for a large motor car manufacturer.

We can take care of both your special and standard molding machine requirements. We have been designing, building and adding to the Tabor line for over 60 years, keeping pace with changing foundry practice. Tabor offers the right type of machine for any molding need. Write for bulletins descriptive of any of the following:

SQUEEZERS and JAR SQUEEZERS • HINGED and TRUNNION ROLLOVER MACHINES • JAR and JAR SQUEEZE FLASK LIFT MACHINES • PLAIN and SHOCKLESS JAR MACHINES

SPECIAL MOLDING MACHINES
TABOR-BRASIVE CUTOFF MACHINES

MEMBER

Since 1884 . . . MANUFACTURERS OF FOUNDRY MOLDING MACHINES

THE TABOR MANUFACTURING CO.

6225 Tacony Street • Philadelphia 35 • Pennsylvania

Representatives: Snyder Foundry Supply Company, Los Angeles, Calif.; Gallagher Foundry Supply Co., San Francisco and Oakland, Calif.; Carl F. Miller & Company, Seattle, Wash.

OHIO FERRO-ALLOYS CORPORATION a major supplier of FERRO SILICON

Tagged for *important* production

For almost every Silicon requirement in the Iron and Steel industries there is an Ohio Ferro-Alloys Ferro Silicon to meet the most rigid specifications; high metallurgical standards and the exclusive Ohio Ferro-Alloys metalcast process provide this assurance. Many iron and steel producers always rely on Ohio Ferro-Alloys' prompt supply service exclusively and gain valuable assistance from a "production minded" staff when problems relating to ferro-alloy applications are at hand. A friendly discussion with an Ohio Ferro-Alloy representative may be helpful to you — why not phone or write to arrange a meeting now?

FERRO SILICON 50%, 75%, 85%, 90%
H. C. FERRO CHROMIUM • FERRO MANGANESE
BOROSIL • SIMANAL

BRIQUETS
SILICON • MANGANESE • CHROME

PHILO RANIER

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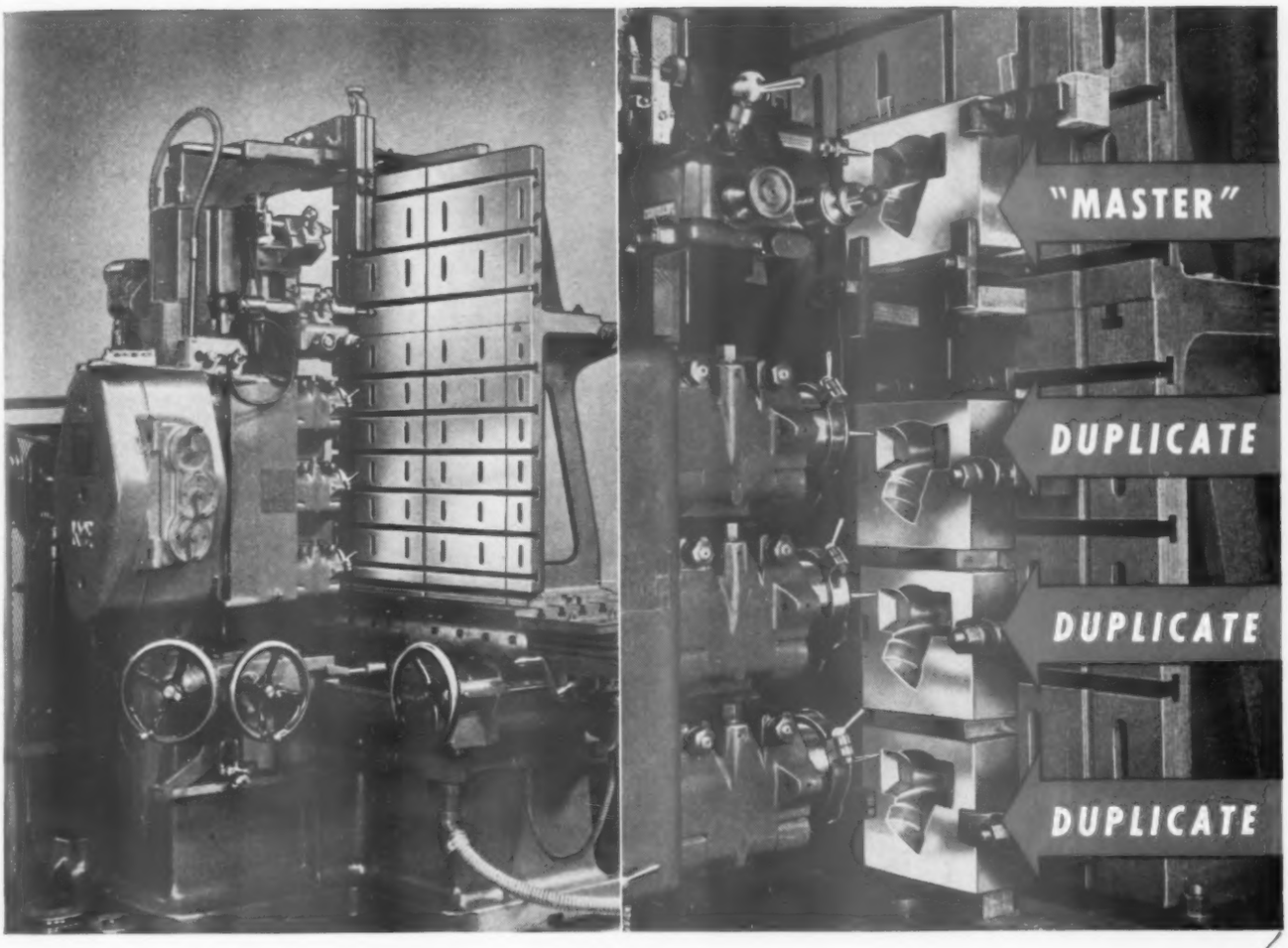
Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma



Service Now Available

KELLER MACHINE AND PATTERN WORK

HOWARD modern facilities include two 3-spindle, automatic-type Pratt & Whitney Keller Machines which are now available for immediate service on all types of metal duplicating work.

Other **HOWARD** facilities include wood and metal production patterns, brass, bronze and gray-iron castings.

At **HOWARD**, you will find the highest type of skilled craftsmen and modern equipment — a combination that assures you of patterns and castings that are precision-engineered to fit your individual foundry requirements. Your inquiry is invited.

No Pattern too Large or Small for our Consideration

HOWARD FOUNDRY CO.

Pattern Division

1700 N. KOSTNER AVE. CHICAGO 39, ILL.

ARMY NAVY

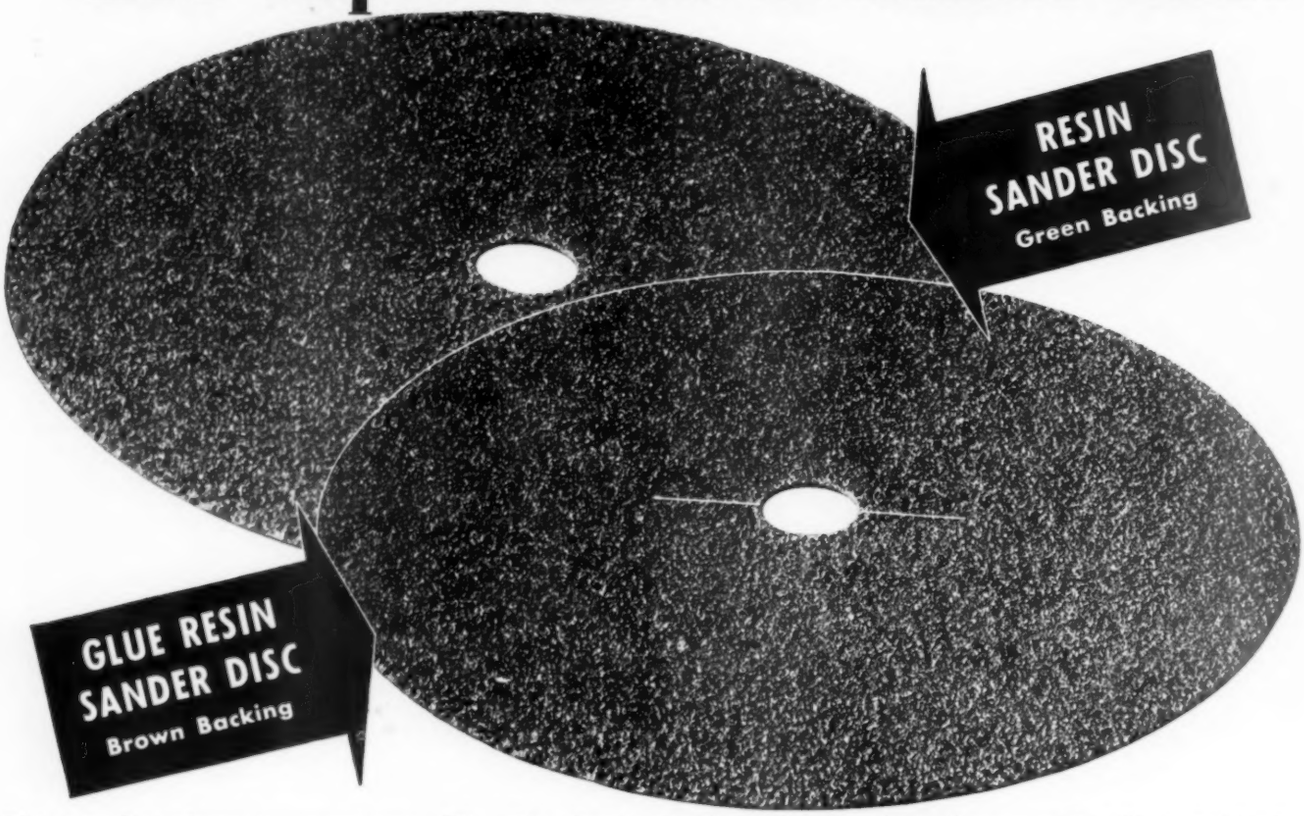
HOWARD

ALUMINUM BRASS BRONZE MAGNESIUM SEMI-STEEL

HOW-M-LITE CAST-M-RITE CAST-M-RITE FLY-M-LITE STA-M-RITE

PATTERNS

FIRST NEWS about a BIG improvement in Sander Discs



This is the first information on two new sander discs by CARBORUNDUM. They have such improved performance that we want to get the news to you as soon as possible. A quick listing of advantages would include:

1. **Substantially longer life.**
2. **Faster cutting.**
3. **Heat resistant.**
4. **Broad application in metal surfacing.**

The obvious benefit, of course, will prove to be more production at lower abrasive cost.

The Glue-Resin Sander Disc by CARBORUNDUM, with brown backing, will be found to give broad usage and unusual service in all metal surfacing operations. It is available in the following six grit sizes: 16, 24, 36, 50, 60, 80.

The Resin-Sander Disc, with green backing, and same grit selection as the Glue-Resin Disc by CARBORUNDUM is specially recommended for severe sanding operations and the edge-wear grinding jobs which take such a heavy toll of ordinary discs. The backing of both discs are marked for ready identification, usage and reordering.

These discs by CARBORUNDUM are standard in 7" and 9⅛" dia. The Glue-Resin Sander Discs are available in Type D-1 (center hole with slits) while the Resin Sander Discs are available in Type D-2 (center hole only). Prompt deliveries will be made from standard stocks in plant and branch warehouses.

Call your CARBORUNDUM salesman or distributor's representative for complete information. The Carborundum Company, Niagara Falls, N. Y.

For sanding and finishing satisfaction... **CALL IN**

CARBORUNDUM

TRADE | MARK

BONDED ABRASIVES

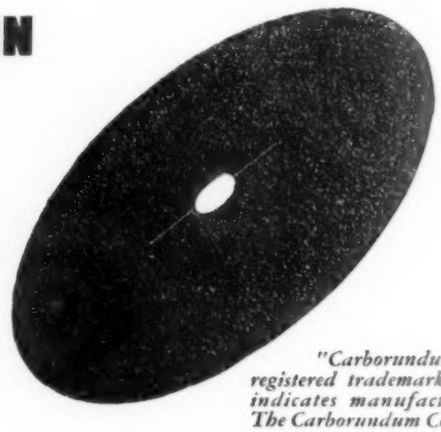
WHEELS
Silicon Carbide
Aluminum Oxide
Diamond
Cylinder Hones
Sticks, Stones & Rubs
Specialties

COATED ABRASIVES

Paper, Cloth and Combination
Sheets, Rolls, Discs

ABRASIVE GRAINS AND COMPOUNDS

for:
Polishing
Lapping
Pressure Blasting
Finishing



"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company

YOU'RE THROWING MONEY AWAY WITH YOUR OLD CRUCIBLE FURNACES

Scrap them At a Profit

Here is a "revolutionary" TOP fired crucible melting furnace... it's different... it's new... and it's better. This TOP Fired tandem furnace has two crucibles, loaded at all times... they are fired alternately. While the first crucible is heated, the flue gases from it preheat the second crucible. While the metal from the first crucible is being poured, a third crucible replaces the removed crucible to receive cold metal. The covers are cam lifted and swung backward independent of one another, allowing each side to be alternately fired. The advantages are so outstanding that no one can afford to use the older type. Refer to column on left-hand side . . . *write today.*

1. 25 to 30% fuel saved on aluminum and magnesium. 40 to 50% fuel saved on brass and copper.
2. 50 to 100% longer pot life.
3. 50 to 100% longer lining life.
4. 50 to 100% longer cover life.
5. 50 to 100% longer burner life.
6. Easy to charge. (No flame through cover)
7. Far lower metal loss. (Flame does not impinge on metal)
8. Faster heating. (Combined radiant and convection heating)
9. Less slagging. (Less slagging and no slag build up possible)
10. Lining is easy to replace. (No burner ports)
11. Burners easy to inspect and replace. (Change in 15 minutes)
12. Burners cannot plug. (Burners in top where slag or metal cannot reach them)
13. Pure metal. (Neutral pressure on metal surface allows charcoal or atmosphere to be used)
14. Furnace can be flued through the floor to the outside, eliminating heat and gases in foundry.
15. No leakage of cover. (No flame through or around cover)
16. Quiet operation.
17. Unobstructed flueing. (Flued at bottom and charge does not affect it)
18. Metal is visible at all times and temperature can be taken at any time, without shutting off burners.

Unloading TOP fired furnace

RADIANT COMBUSTION, Inc.

BUILDERS OF EVERY TYPE (OIL, GAS, ELECTRIC) OF HEAT TREATING FURNACE

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RADIANT COMBUSTION, Inc.
WARREN . . OHIO

Please give us further information

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Your Name_____

Address_____

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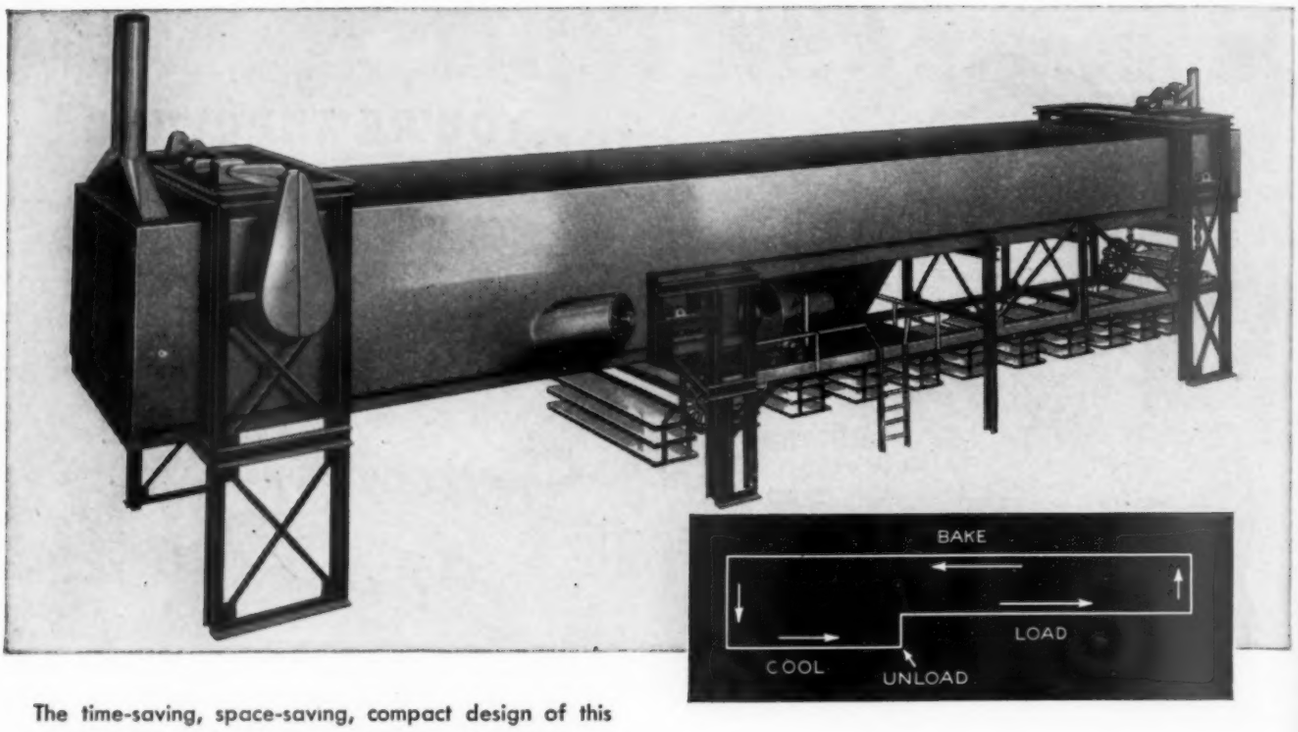


The time-saving, space-saving, compact design of this new Horizontal Core Oven is characteristic of Young Brothers' Engineering. Into it went the skill and confidence of many years of experience . . . also a thorough knowledge of the job to be done and the production problems involved.

This new core oven can be installed in practically any building without making any major structural changes.

The coremakers are located right next to the oven so that they can load the cores directly on the moving racks thus eliminating the necessity of transporting them on hand trucks or a conveyor from the core room. The location of the coremakers, at the oven, also saves core room space.

The size of the loading racks can be varied and the shelves can be adjusted to accommodate cores of many sizes and shapes.

Besides allowing for the removal of exhaust gases at the point of greatest concentration, the new oven design provides an effective cooling zone for the cores and assures comfortable working conditions for the coremakers.

This New Horizontal Core Oven is Young Brothers' answer to the demand for better core baking equipment. It is YOUR answer to the need for lower production costs and higher operating efficiency.

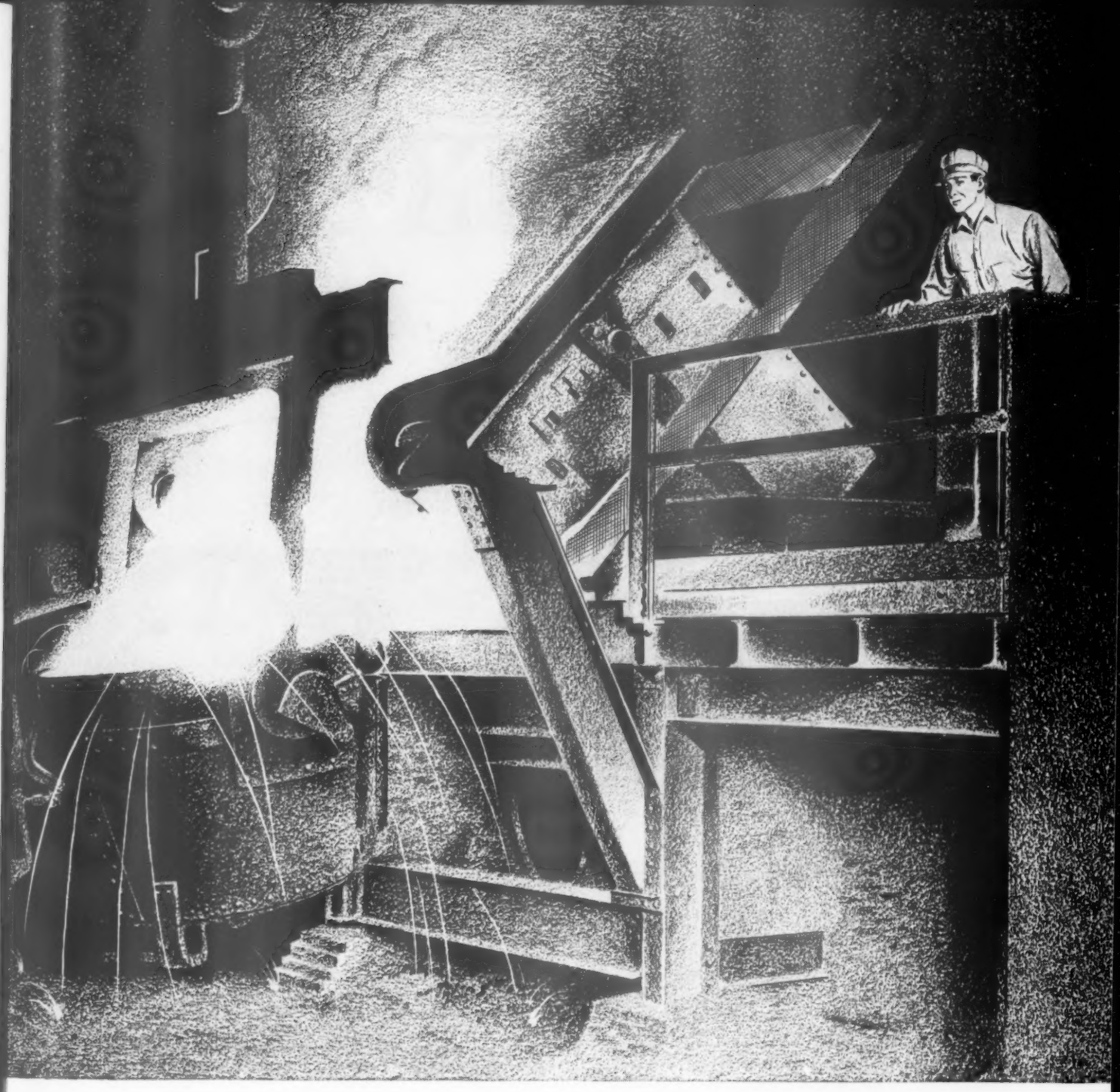
New HORIZONTAL CORE OVEN . . . . . offers many cost saving advantages!

MEMBER

YOUNG BROTHERS COMPANY

6508 MACK AVENUE DETROIT 7, MICHIGAN

ESTABLISHED IN 1896



VANCORAM FERRO CHROMIUM

INSURES HIGH QUALITY CHROMIUM STEELS

Effective improvement in the quality of chromium steels is demonstrated beyond question by the use of Vancoram Brand Ferro Chromium. This alloy is offered in three grades, each made by modern electric smelting practice from carefully selected raw materials. Every step in its production is precisely controlled by experienced technicians, assuring an alloy of the required chromium content, low in impurities—a sound, uniform product that measures up to the most exacting standards. To meet your specialized needs, we offer:

- Low Carbon Ferro Chromium . . . for stainless and heat-resisting steels . . . available in standard grades of carbon content of 0.06% maximum to 2% maximum, all containing from 67 to 72% chromium.
- High Carbon Ferro Chromium . . . used in wrought constructional steels, cast steels and cast iron . . . containing 66 to 70% chromium and 4 to 6% carbon.
- Iron Foundry Ferro Chromium . . . developed especially for ladle additions to cast irons . . . with chromium content of 62 to 66%, carbon content from 4 to 6%, and silicon content 6 to 9%.

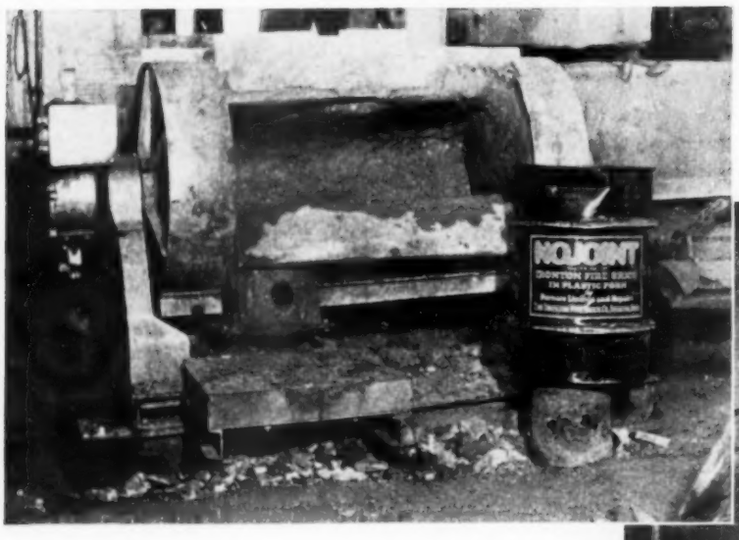
MAKERS OF VANCORAM FERRO ALLOYS AND METALS

Vancoram Brand Ferro Chromium is supplied in lump form, or crushed, or ground to various sizes. Our staff of experienced metallurgists is available for consultation to assist you in the use of ferro alloys.

VANADIUM CORPORATION OF AMERICA

420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • DETROIT • CHICAGO • CLEVELAND • PITTSBURGH

"IRONTON NOJOINT" for Foundry Ladles



"Ironton Nojoint", a special type of plastic ramming refractory continues to give extra long service in U-shaped as well as cylindrical-receiving, mixing and desulphurizing ladles. It is easy to install, it is highly resistant to soda slags and there is no possibility of carbon pick up from "Ironton Nojoint" linings.

We offer you the assistance of an engineer in installing the original lining and training your men to do the job.

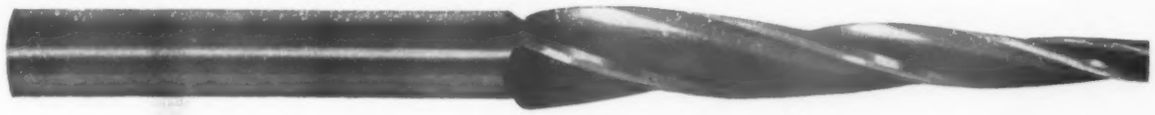
Ask us for complete information on "Ironton Nojoint".

THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

Coni-Cutters



The only tapered—Constant Spiral—Three fluted — Hollow ground — End Mill for either Wood or Metal offered in 1° - 2° - 3° - 5° - 7° taper. High speed steel flute lengths ¾" to 3¼"

COLORS FOR SHELLAC

POWDER FORM

Black
A strong jet black dye. One pound will color a barrel of shellac

Red
Very bright

Yellow
Distinctive and bright

Green
Deep color will meet your requirements

Purple
Dissolved in alcohol with a small amount of shellac added makes a perfect preparation for layout work

SHELLAC POT

Annealed glass—tough and durable—large capacity, 1½ quarts—will not discolor shellac

MOULDERS TOOLS

One piece forged steel in stock for immediate delivery

ZINC TAPE

For embossing machines—in rolls—carried in stock—⅜" to 1½" wide

WRITE FOR PRICES AND LITERATURE—DEALERS INQUIRIES INVITED

THE FREEMAN SUPPLY CO.

PATTERN SHOP AND FOUNDRY SUPPLIES AND EQUIPMENT . . . MAHOGANY AND PINE PATTERN LUMBER

TOLEDO 5, OHIO

Competition Tough?

HERE'S ONE WAY FOR THE FOUNDRY TO LICK IT

A 7,500 lb. Cr-Ni-Mo runner casting being Magnaflux inspected at the Commercial Casting Co., Marion, Ohio

CONTROL QUALITY IN PRODUCTION WITH THIS NEW PORTABLE MAGNAFLUX* UNIT!

There is an increasing demand for better and better castings. To meet this swing to higher standards, it is essential for all foundries to be more critical of their output . . . to guard priceless reputation by 100% inspection. It pays to detect all flaws before customers see them. That's why more and more foundries turn to Magnaflux for quality control. Every casting can be inspected non-destructively—quickly and economically—with Magnaflux. It reveals shrinkage cracks, porosity, blow holes, cold shuts and many other surface and sub-surface discontinuities. The size, shape and location of these flaws is "spotlighted" in minute metallic particles.

The new KH-2 Magnaflux unit, pictured above with the XB-2A Powder Blower provides low-voltage, high amperage outputs—both AC and half-wave rectified current for either AC or DC magnetization and demagnetization after inspection.

It's easy to build confidence in your castings with Magnaflux equipment and materials that provide thorough inspection. For your sales' sake, write today for complete data and free copy of the latest Magnaflux bulletin.

MAGNAFLUX CORPORATION

*MAGNAFLUX – Registered U. S. Patent Office, a trade mark of the Magnaflux Corporation applied to its equipment and materials for magnetic particle inspection.

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5918 Northwest Highway, Chicago 31, Illinois
NEW YORK • DETROIT • DALLAS • LOS ANGELES • CLEVELAND

A NEW REVISED EDITION— ASK FOR YOUR COPY NOW

• Foundrymen interested in obtaining a high-strength, heat- and wear-resistant iron will find in this 48-page booklet the most recent information on the properties, production, and uses of chromium cast iron. Numerous pictures, tables, and graphs illustrate the general and technical information contained in "Chromium in Cast Iron."

Typical chapter titles are: "Metallurgical Effects of Chromium Additions," "Chromium Reduces the Growth of Cast Iron," "Chromium Increases the Resistance of Cast Iron to Oxidation," "Welding Chromium Cast Iron."

You should have this helpful booklet handy for ready reference. Copies are available without obligation through Electromet field metallurgists or through the Electromet offices listed below.

You can get these other helpful booklets, too:

Abrasion-Resistant High-Chromium Iron

Briquetted Alloys for the Cast Iron Foundry

Chill Tests for Controlling Quality of Cast Iron

Chromium Cast Iron for Furnace and Stove Parts

"CMSZ" Alloys for Ladle Additions of Chromium to Cast Iron

Foundry-Control Methods in Making Uniform Cast Iron

"SMZ" Alloy and Its Uses as a Ladle Addition to Cast Iron

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Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

ELECTROMET Ferro Alloys and Metals are sold by Electro Metallurgical Sales Corporation; and Electro Metallurgical Company of Canada, Limited, Welland, Ontario.

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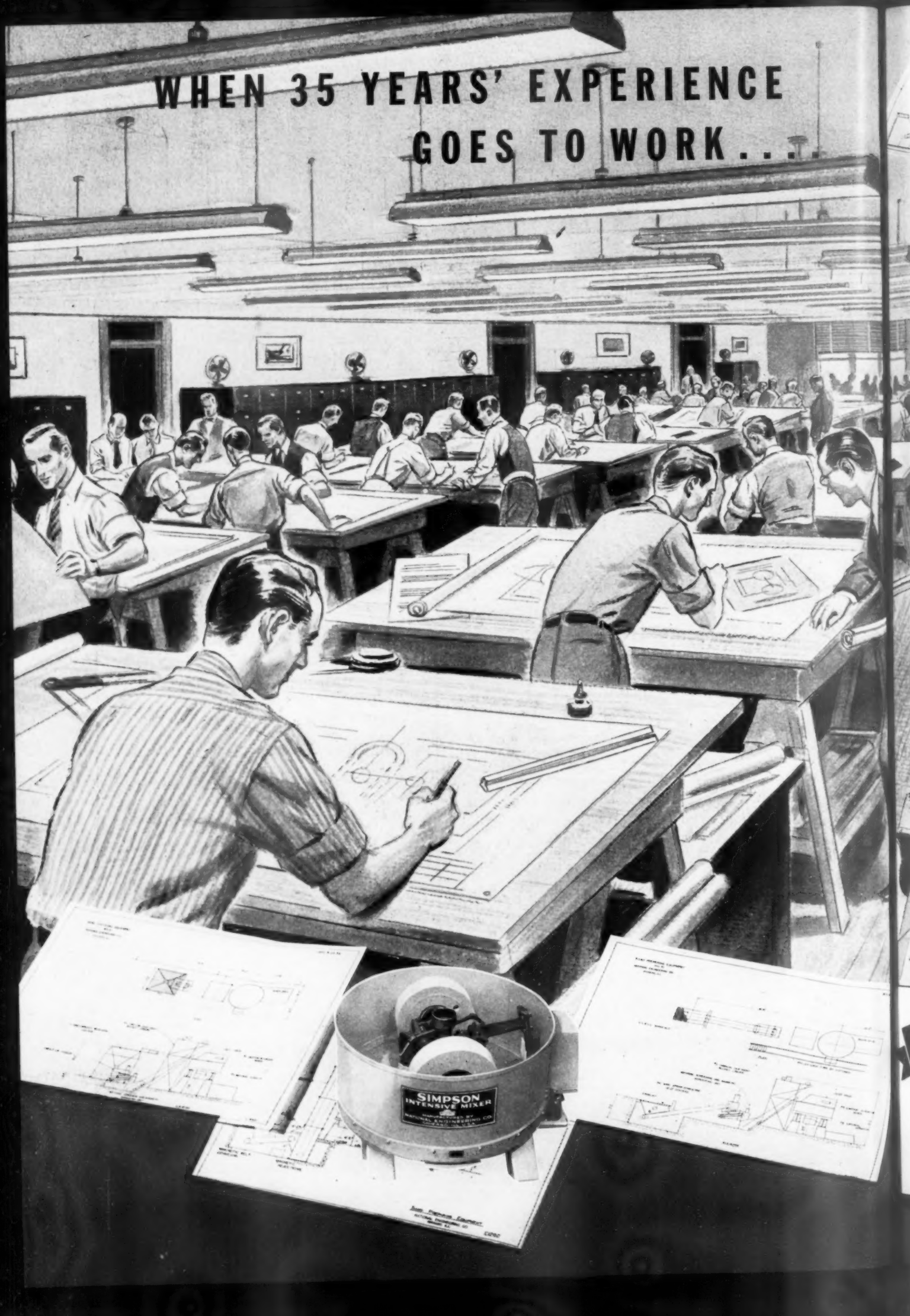
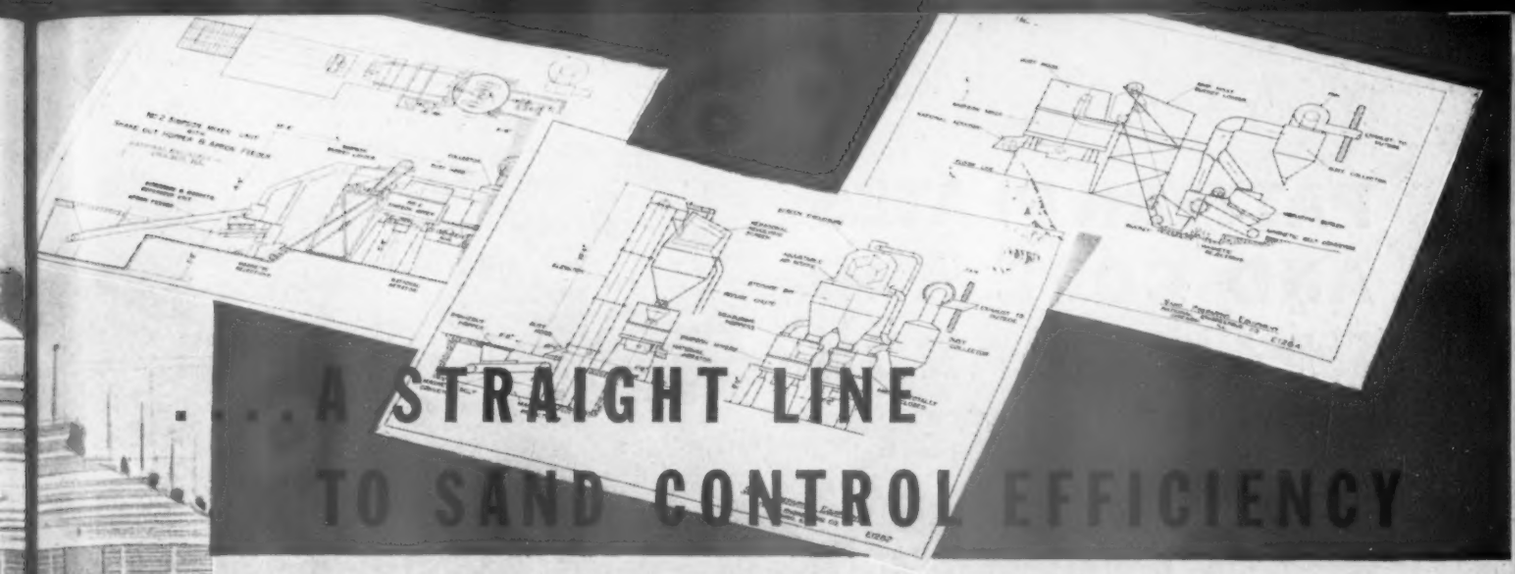

WHEN 35 YEARS' EXPERIENCE
GOES TO WORK . . .
SIMPSON
INTENSIVE MIXER



. . . A STRAIGHT LINE TO SAND CONTROL EFFICIENCY

NATIONAL *Engineering Service*

FOUNDRY Sand Control Engineering has been the special province of National Engineers for thirty-five years. During this time they have designed and engineered sand systems and equipment for hundreds of foundries, large and small, of all types: magnesium, aluminum, iron, steel, brass and bronze. They have helped foundries produce the highest quality castings at the lowest net cost per ton.

A broad background of practical foundry experience and years of concentration on the proper solution to foundry sand problems equips National Engineers to layout, design and build the right system for the special requirements of any foundry. This means top operating efficiency is achieved — and maximum production with savings in time, labor, power and materials possible in nearly every case.

If you are seeking the shortest route to proper sand preparation, handling, reclamation, storage and control let National Engineering experience help you. Whether it is a problem of today or part of your long range planning, a National Engineer will gladly work it out with you.

FIELD SERVICE

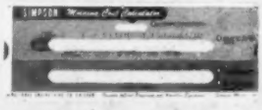
National engineers are on the job constantly helping foundries solve problems of sand handling and control on construction, maintenance, repair or new requirements.

CASTING WEIGHT CALCULATOR

Many thousands of these simple, easy-to-use calculators have been distributed throughout the foundry industry. They help save time and avoid guesswork in estimating castings.

MOLDING COST CALCULATOR

This handy Simpson Molding Cost Calculator computes molding cost per ton of castings—number of molds needed for certain number of castings—weight of metal needed to pour remaining molds and cubic content of the mold. Free to foundrymen—write for yours.



SIMPSON

INTENSIVE MIXERS

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

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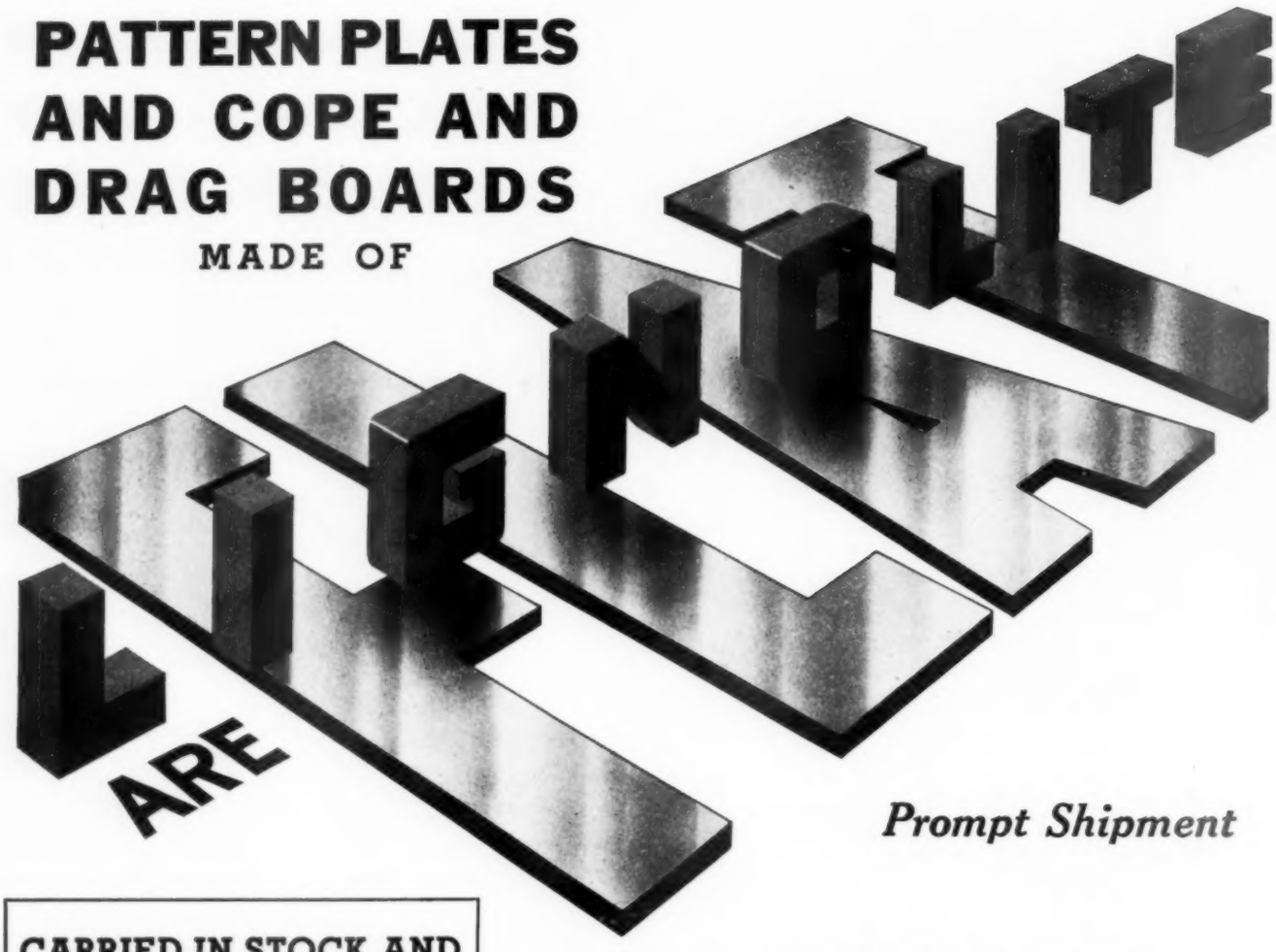
PATTERN PLATES AND COPE AND DRAG BOARDS

MADE OF



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1039 Elliott Avenue West, Seattle, Wash.

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GEORGE F. PETTINOS, (CANADA) LTD.
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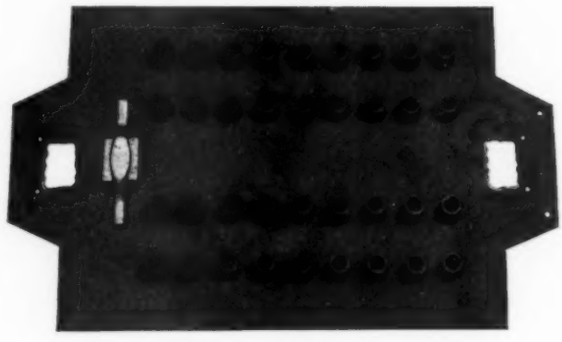
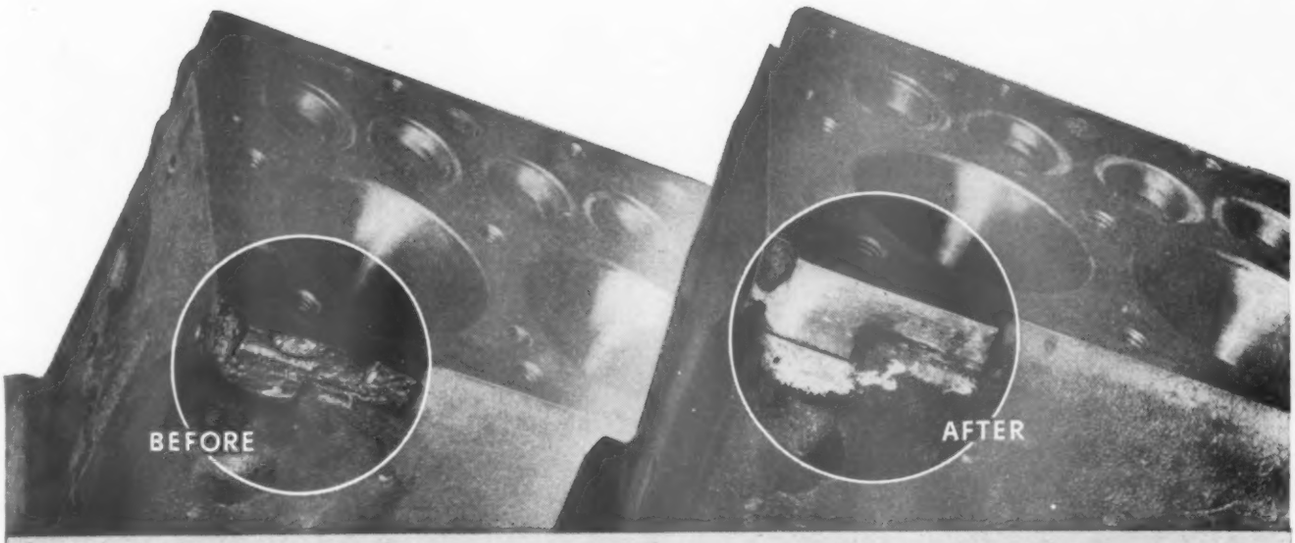
● They stay flat because LIGNOLITE has high transverse strength and resistance to deflection. It is impervious to moisture and does not warp from contact with wet sand or high humidity. LIGNOLITE is half the weight of aluminum, is abrasion proof, of uniform caliper, and may be easily machined, sawed, drilled, tapped. Available in all flask sizes 7/16″ to 2″ thick or in sheets for own cutting. Write for sample and complete information.



Mounted LIGNOLITE Pattern Plate

MARATHON CORPORATION

CHEMICAL DIVISION — **ROTHSCHILD, WISCONSIN**



NI-ROD REPAIRS CASTINGS Quickly Easily

With smooth-handling Ni-Rod available, you can effectively salvage castings with sound, *crack-free* welds.

These "BEFORE" and "AFTER" pictures show how welding with Ni-Rod cuts costs for a leading automobile manufacturer.

Left photo shows a defective cylinder block. Machining revealed a blowhole right at an important lug section.

Right photo shows the same block after the section had been ground down . . . built up with Ni-Rod . . . finished by grinding.

It is just as sound as a perfect casting.

No preheat was required and finishing was easy. The foundry reported Ni-Rod to be the best welding rod they ever used to repair castings.

You'll find plenty of jobs for Ni-Rod. Deposits are smooth, sound, strong, machinable, and close to the color of cast iron. Ni-Rod is easy to handle; slight variations in manipulation do not affect weld quality. And, you can use Ni-Rod on a.c. or d.c.

Order a 5-lb. package, and see for yourself how easy it is to salvage castings. Instruction booklet will be sent upon request.

INCO NI-ROD

THE INTERNATIONAL NICKEL COMPANY, INC. • 67 Wall Street, New York 5, N.Y.

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J. M. TULL METAL & SUPPLY CO. Atlanta

METAL GOODS CORPORATION Dallas-Houston-New Orleans-Tulsa

EAGLE METALS COMPANY Portland-Seattle

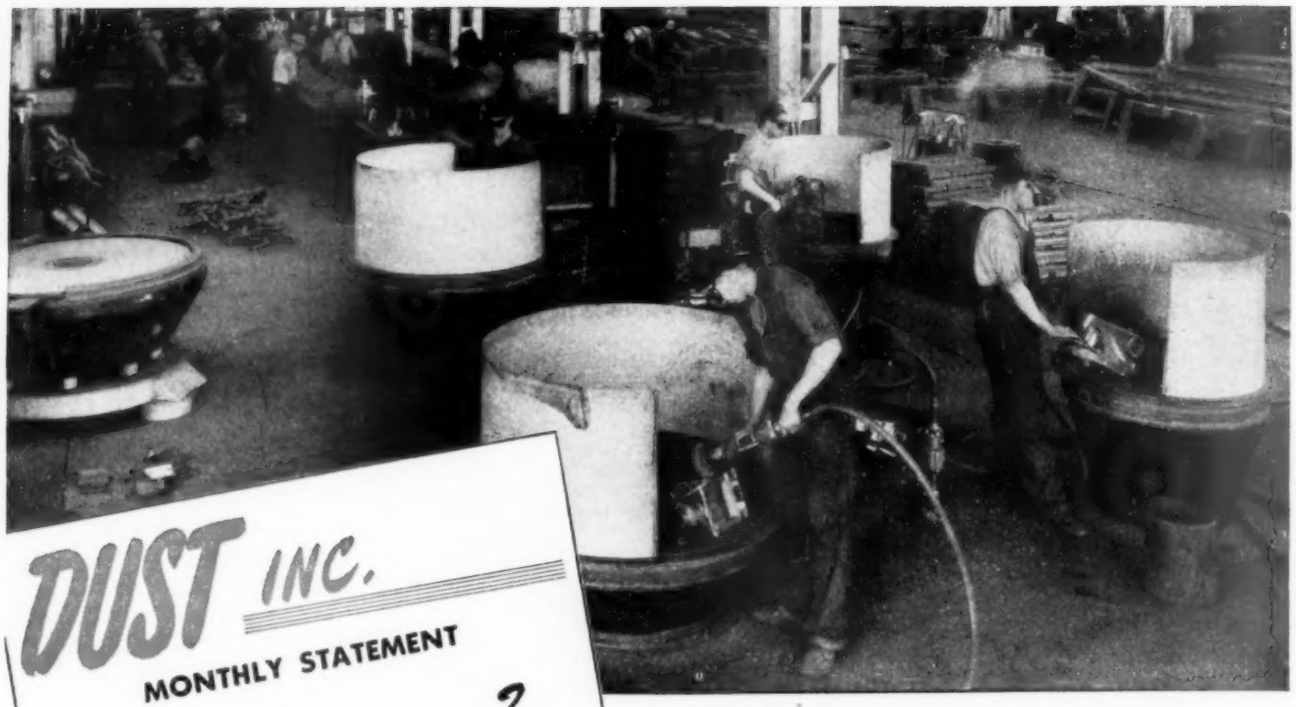
HENDRIE & BOLTHOFF MFG. & SUPPLY CO. — Denver

ROBERT W. BARTRAM — Montreal

ALLOY METAL SALES, LTD. — Toronto

WILKINSON COMPANY, LTD. Vancouver

Call or write for more information.



DUST INC.

MONTHLY STATEMENT

Lowered efficiency of workers.....$?

Deterioration of machinery and equipment.....$?

Inferior quality of output.....$?

Downtime and cost of machinery repairs.....$?

Total.....$?

HOW MUCH does DUST cost YOU?

● Even though you don't actually receive a bill, you *pay* for lack of proper dust control—make no mistake about that!

If your dust control equipment is anything less than 100% adequate, it's costing you plenty in lowered worker efficiency, in over-rapid deterioration of machinery, and in many other ways.

You can rid your business of this serious cost burden . . . clear out harmful dust in your plant and keep it out . . . with an efficient, economical Dust Control System planned, designed, and installed by Kirk & Blum.

For a remodeling of present facilities or installation of a complete new system, you can safely rely on the unbiased counsel of Kirk & Blum "Air Engineers", For details, write to

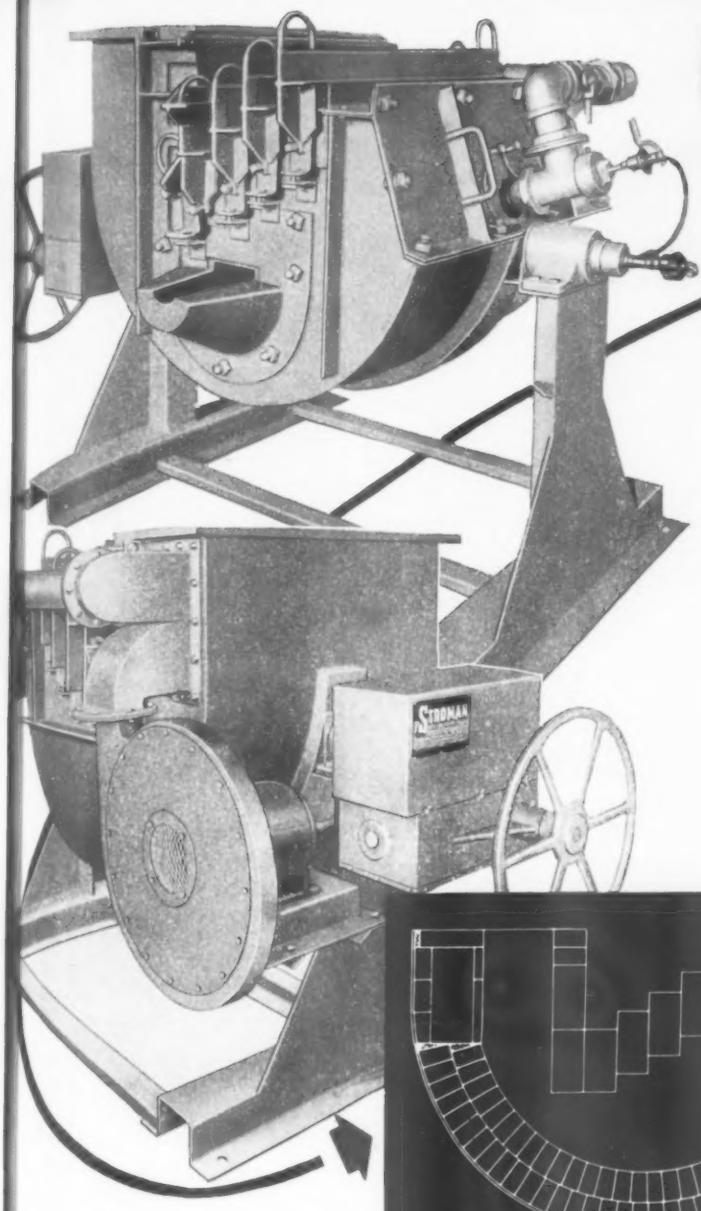
KIRK AND BLUM

Engineered **Dust Control**

K & B Dust Control is *engineered* to meet individual plant needs. It's thoroughly *dependable*—backed by 39 years of experience in providing high-efficiency installations for leading plants the nation over.

The KIRK & BLUM MANUFACTURING Co.

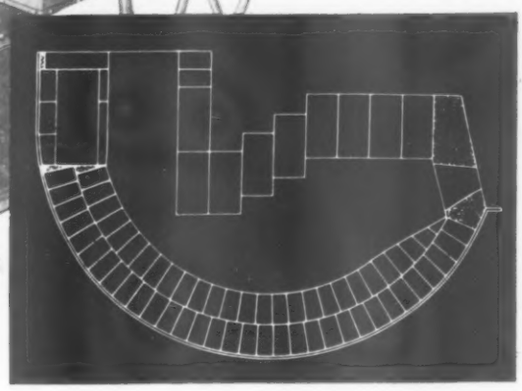
2803 SPRING GROVE AVE. CINCINNATI 25, OHIO



Another STROMAN First!

SKLENAR FURNACES FOR MELTING GREY IRON AND COPPER ALLOYS!

Sklenar Non-Crucible, Direct Fired, Improved Reverberatory Melting Furnaces have been tried and proved highly successful for making Grey Iron Castings, with gas and oil fire. By installing Sklenar Furnaces, grey iron foundries may now be operated in the same manner as brass foundries, by casting successive heats throughout the day. Average melting time is from 40 minutes to one hour per heat. Sklenar Furnaces to handle 500, 750, 1200 and 2000 pounds are now available . . . larger sizes to handle up to 10,00 pounds will be released at a later date.



In these remarkable furnaces metal is charged into a hopper which is also an exhaust from the combustion chamber. Here metal is preheated and melted at the throat of the hopper. Cold metal does not reach the molten bath. Charging is continuous. These furnaces will melt faster and give greatest fuel economy, as combustion chamber is heated by the same fuel used to melt the metal in the throat of the hopper. Available with either mechanical or hand tilt . . . oil or gas fire. . . . and remember Sklenar Furnaces handle non-ferrous metals perfectly too.

STROMAN MANUAL TILT CRUCIBLE FURNACES

For Brass, Bronze and Aluminum

Redesigned and engineered for better and faster melting as well as greater fuel economy. Many leading foundries find them indispensable. They will do your job better and effect many savings. Oil or Gas Fire. Capacities from No. 40 to No. 400 Crucible.

New Stroman Crucible Stationary Melting Furnaces

For Brass, Bronze, Aluminum and other non-ferrous metals

Sturdy, efficient and featuring the Stroman Push-Back Cover, these stationary furnaces are designed for peak production and greatest fuel economy. Oil or Gas Fire. Capacities from No. 20 to No. 400 Crucible.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. 300 W. ADAMS ST. CHICAGO 6

FOR POST WAR COMPETITION . . .

PICTURE THIS IN YOUR FOUNDRY!

. . . . . and there is always a place in your picture for a Demmler Core Blowing Machine, particularly the DEMMLER No. 2.

Carefully designed for profitable use on a wide variety of core blowing jobs, the No. 2 DEMMLER Core Blowing Machine produces quality cores at a high rate of speed with maximum economy.

The No. 2 DEMMLER is unequalled for core work as applied to pipe fittings up to three inch size, automobile malleable and gray iron castings, agricultural machinery casting and similar work.

This machine possesses all the refinements born of years of experience in building core blowing machines, and WM. DEMMLER & BROS. have been building core blowers since 1911—were the first in the field.

Meet post-war competition by installing the No. 2 DEMMLER Core Blowing Machine. There is none more efficient or economical than a No. 2 DEMMLER.

Specification Sheet Sent On Request

Wm. DEMMLER *& Bros*

Kewanee, Illinois

MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911

HOW we increased Tonnage 30% *with* HYDRO-BLAST

Kutztown Foundry and Machine Corporation of Kutztown, Pa., tells of methods which broke a bottleneck in the cleaning room.

WHAT WE SAW: "Our casting production hobbled, held back by our limited capacity to clean and chip castings—basically a problem of man-power

"Labor cost per ton for cleaning ran excessively high

"And castings were not thoroughly cleaned"

WHAT WE DID: "We installed a Hydro-Blast unit for knocking out cores and cleaning castings by the wet sand and water method"

WHAT WE GOT: "**Tonnage jumped immediately** from 600 tons to 800 tons per month with the same man-power

"Average cleaning time was cut 80 percent

"Castings are cleaner—surgically clean!

"Big drop in per-ton cost of cleaning

. . . not to overlook these by-products:

"We're building a good stock pile of washed sand, and re-using it for facing and cores

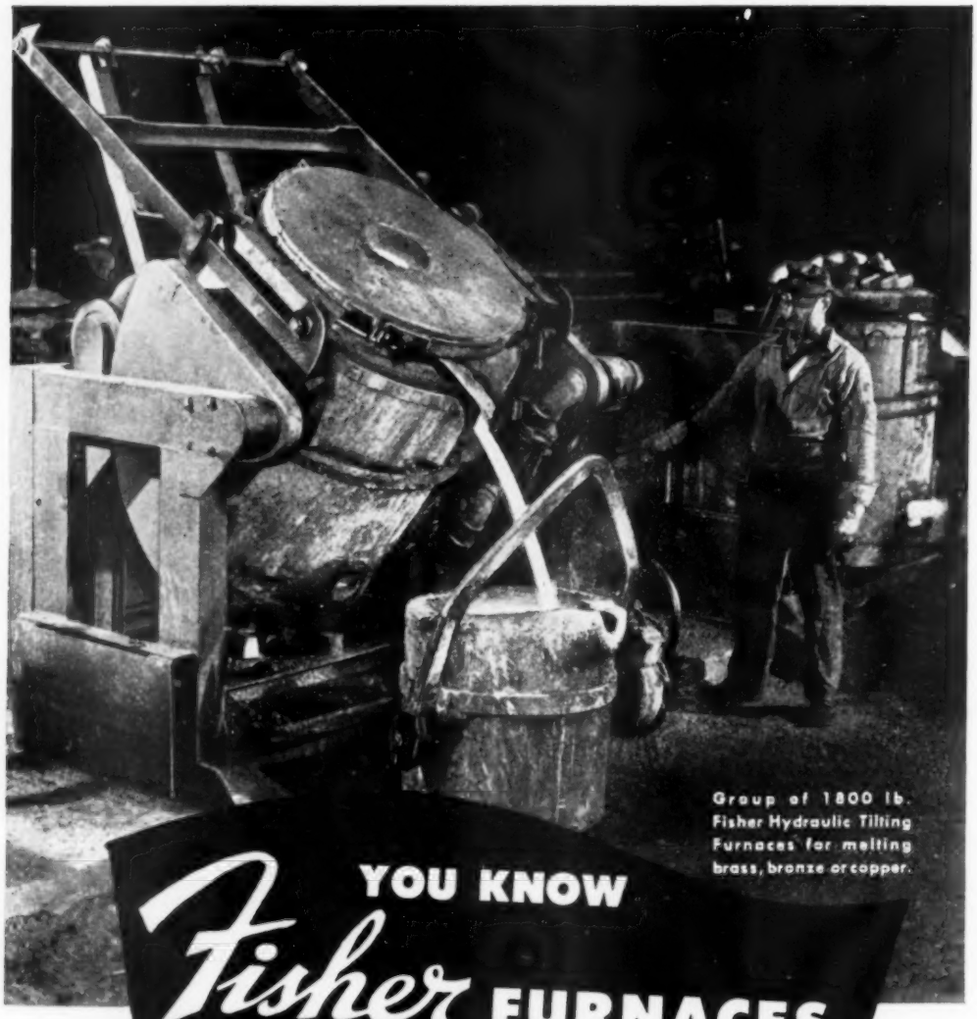
"Gone is the dirty, dusty cleaning room — replaced by a clean, wholesome, pleasant place to work."

You can count on just such results with Hydro-Blast—depending on the nature of your products and the size of your plant. For without exception, Hydro-Blast installations have brought vital economies in every kind of foundry. Find out how Hydro-Blast can benefit you—no cost or obligation. Write us.

HYDRO-BLAST

Chicago 47, Illinois

2550 NORTH WESTERN AVENUE



Group of 1800 lb. Fisher Hydraulic Tilting Furnaces for melting brass, bronze or copper.

YOU KNOW Fisher FURNACES CAN TAKE IT

BECAUSE:

1. "Fishers" have been manufactured continuously since 1906.
2. Many "Fishers" are "veterans" of two world wars and are still "going strong."
3. Wide usage of "Fishers" provides data for double checking engineering and development.
4. "Fishers" have the most rugged construction of any furnace offered to the foundry and metal trades.
5. Quality of metal, fuel economy, and labor savings are characteristic of "Fishers."

Remember, if it's Monarch equipment (or parts) it is now made by Fisher.

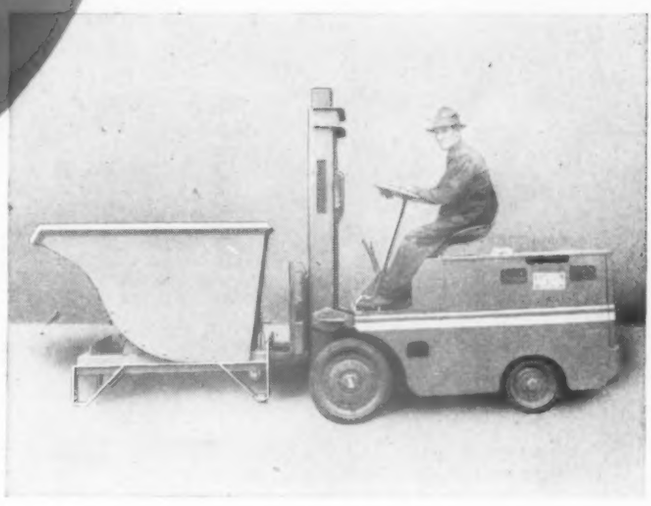
These are the reasons for Fisher's leadership with leaders—the reasons why Fisher Furnaces pay for themselves in an unbelievably short time. Consult Fisher on all your non-ferrous metal melting problems. Write for literature.

5519 NORTH WOLCOTT AVE., CHICAGO 40, ILL.

Fisher FURNACE COMPANY

Engineers and Manufacturers

LOWER COSTS · LESS FATIGUE · MORE FLEXIBILITY IN MATERIALS HANDLING



ROURA
SELF-DUMPING
HOPPERS

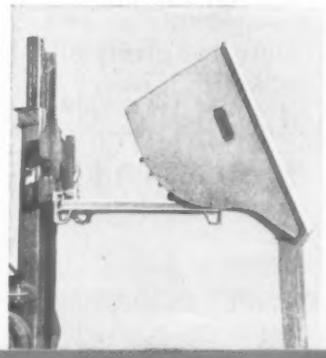
STANDARD—1 cu. yd.—MODEL—$100.00 FOB Detroit. Try one on a 30-day trial basis.

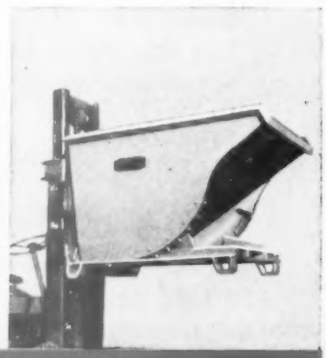
The ROURA Self-Dumping HOPPER picks up, carries and dumps itself with only one manual operation required. Automatically returns to loading position and locks securely.

The dumping container which handles *any kind of bulk material*—hot, cold, wet or dry. ROURA Self-Dumping HOPPERS eliminate hand work. Securely fit any standard fork or platform type lift trucks.

CUT HANDLING COSTS . . . one man can do the work of several with greater safety and in a fraction of the time.

FATIGUE REDUCED 50% in handling operations—*proved* in actual foundry use.





ROURA IRON WORKS
1401 WOODLAND AVENUE, DETROIT 11, MICHIGAN

THE GREATEST ADVANCE IN VIBRATORS...

THE VIBROLATOR!

CIRCULAR ACTION PREVENTS DISTORTED "EGG-SHAPED" CASTINGS

OBSOLETES ANY OTHER METHOD

Foundry men are acclaiming the new PETERSON VIBROLATOR because its action duplicates the technique used by skilled molders in rapping a pattern in all directions to free it from sand. The ALL-DIRECTIONAL pulsation of the VIBROLATOR eliminates casting distortion by providing an equal clearance to all of the mold walls.

SMALL, YET POWERFUL

Small in size, light in weight, and noiseless, the VIBROLATOR packs plenty of speed and power. In fact SO MUCH POWER THAT YOU CAN USE THE NEXT SMALLER SIZE THAN YOUR OLD VIBRATOR, WITH BETTER RESULTS.

★

SIZES AVAILABLE

Size	Weight	Price
⅜"	5 oz.	$ 9.50
½"	9 oz.	11.75
⅝"	12 oz.	13.50
¾"	17 oz.	15.00
1"	25 oz.	18.00

Prices are Net F.O.B. Kewanee, Illinois

NOTHING TO GET OUT OF ORDER

Springless, self-lubricating and self starting, the VIBROLATOR is unique in design, and constructed to give years of trouble-free service.

FOR LESS SCRAP AND INCREASED PRODUCTION IN YOUR FOUNDRY CHANGE NOW TO VIBROLATORS

MANUFACTURED BY

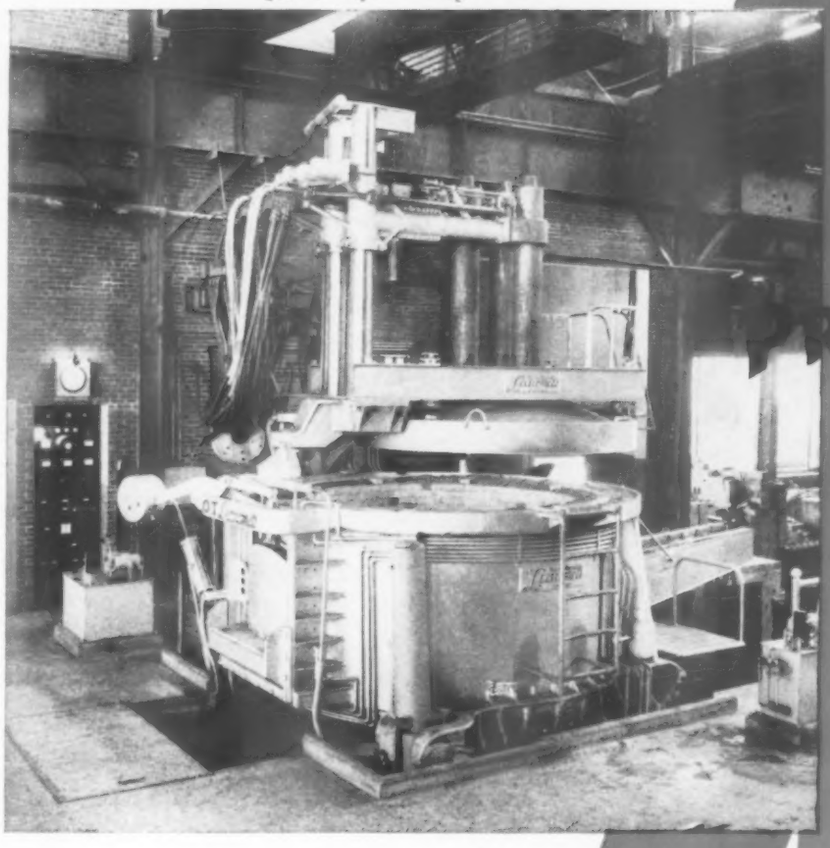
MARTIN ENGINEERING CO.

KEWANEE, ILLINOIS

MOORE RAPID

Lectromelt FURNACES

TOP CHARGING



LOWERS PRODUCTION COSTS

Size OT Lectromelt for melting 12 ton heats. Roof has been raised and swung aside, ready for charging.

MORE production per man hour is an effective means of lowering production costs and that is exactly what Lectromelt's experience proven top charging design can do for you.

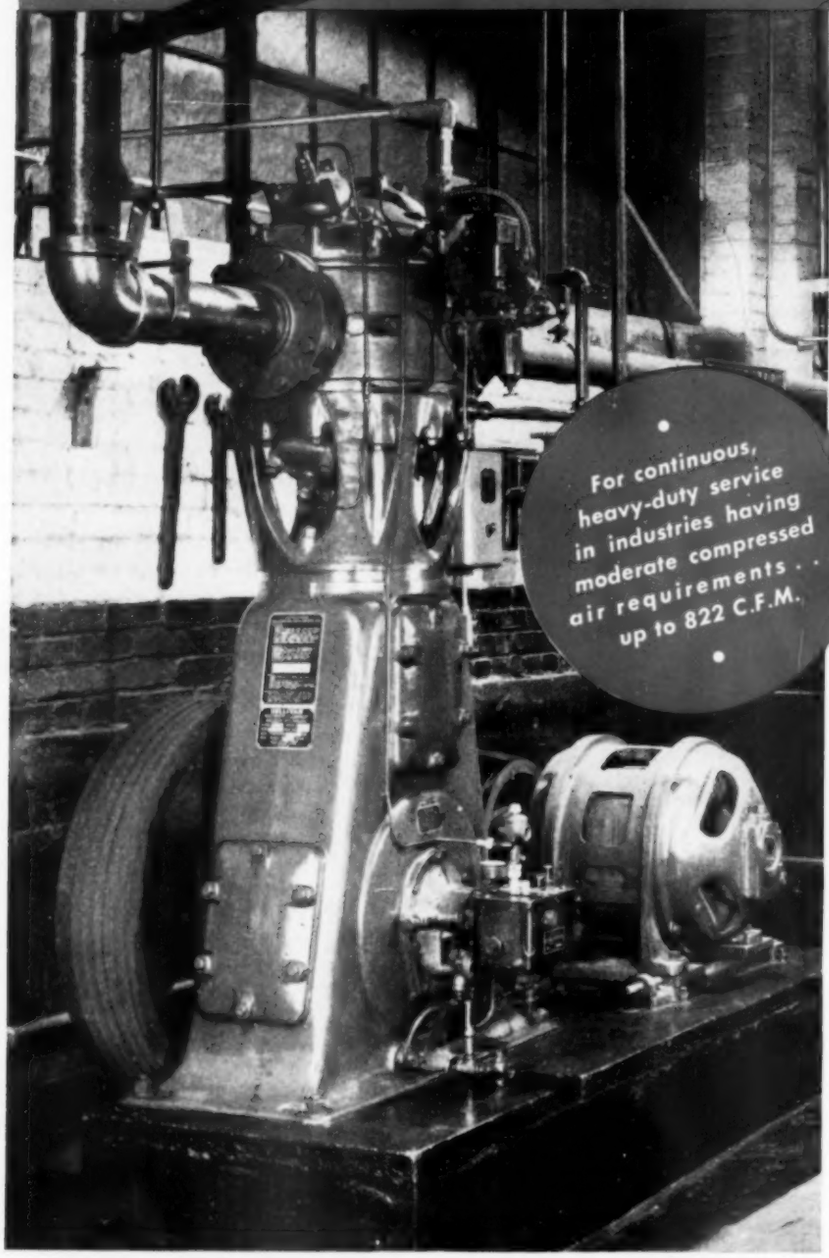
The top-charge furnace readily cuts down that interval between heats. The furnace roof is hydraulically raised and swung aside by the operator moving one valve . . . the drop-bottom bucket places a full charge . . . hydraulic power returns roof to operating position and the furnace is ready to begin melting again. One user reports a three to five minute power off to power on interval averaged, with 30% more pounds produced per man hour with the top-charge furnace than with a door-charge type.

Lectromelt Top-Charge Furnaces are available in capacities ranging from 100 tons down to 250 pounds.

PITTSBURGH LECTROMELT FURNACE CORPORATION

PITTSBURGH..30..PENNA.

the WG-9 another Sullivan modern, heavy-duty compressor



• The Sullivan WG-9 air compressor is ideally suited for plants with moderate volume requirements or for specialized uses in large plants particularly where limited floor space is available. It is a double-acting, heavy-duty, single-stage compressor that will stay on the job twenty-four hours a day with the very minimum of maintenance.

Long, trouble-free operation is assured by:

(1) Cylinder liners replaceable ON THE JOB

(2) Full force-feed lubrication to all working parts

(3) Sullivan patented, long-life, DUAL-cushion valves

(4) Anti-friction main bearings.

Because of its smooth-running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation which can be quickly, easily and cheaply installed right where the air is needed. Available in eleven sizes with displacements from 153 to 822 C.F.M. at pressures from 30 to 150 pounds. Send for Bulletin A-43 for complete details. **Sullivan Machinery Co., Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.**

SULLIVAN

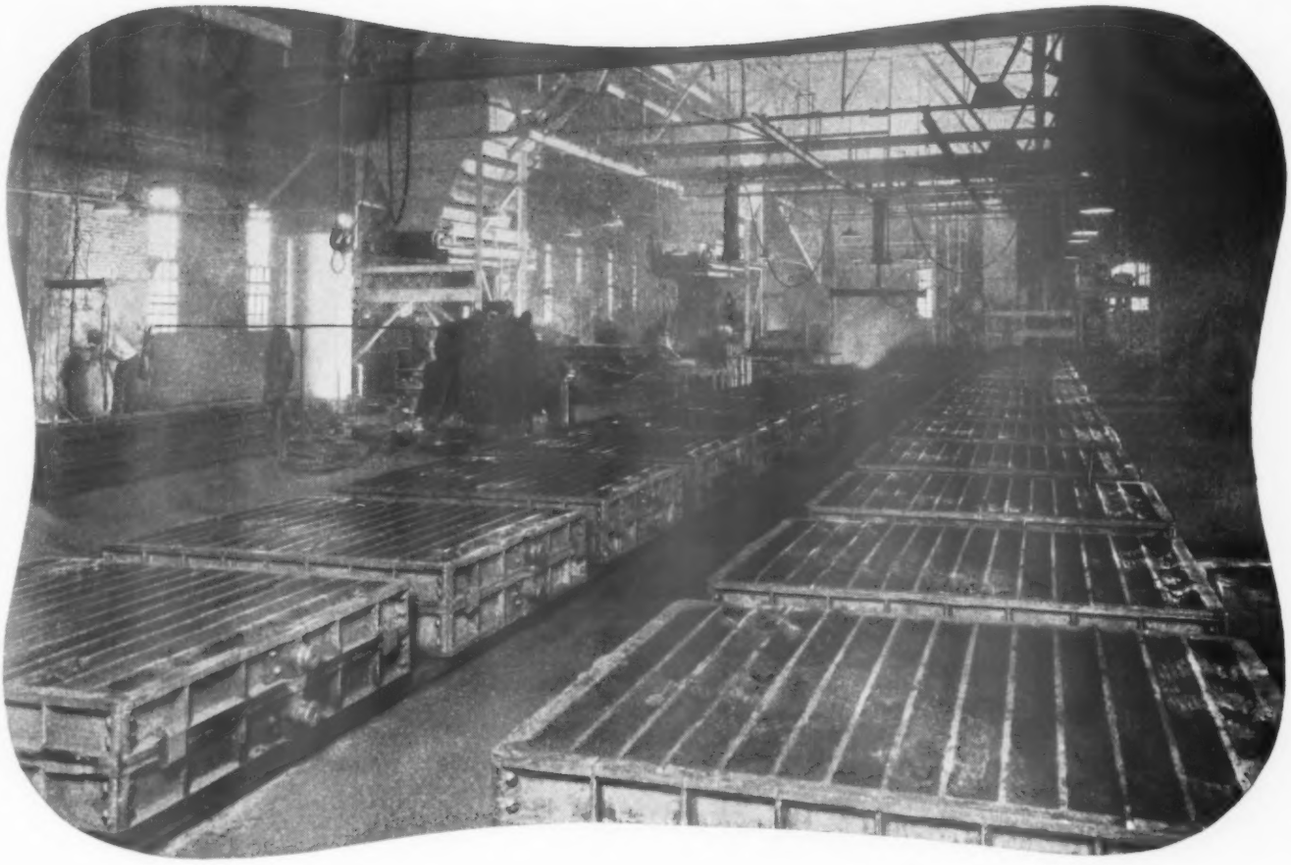
THE WORLD'S FINEST AIR COMPRESSORS FROM 1/4 TO 3,000 H. P.

OFFICES

Birmingham - Boston - Butte - Chicago - Claremont - Dallas - Denver
Duluth - El Paso - Huntington - Knoxville - Los Angeles - Middlesboro
New York - Philadelphia - Pittsburgh - Portland - Salt Lake City - Seattle
San Francisco - Spokane - St. Louis - Washington, D. C.

PRODUCTS

Stationary and Portable Air Compressors, Pneumatic Casting Grips, Foundation Breakers, Portable Hoists, Rock Drills.



Ounces or Many Pounds . . .

Whether your castings are large or small, ferrous or nonferrous, Bartlett-Snow equipment will increase both the quality and quantity of your output. Individually engineered to your own particular requirements, Bartlett-Snow sand, mold and casting handling equipment turns the theoretical advantages of the newer, more fully accepted mechanized foundry practice, into practical dollar and cents advantages. Costs go down. Your product finds readier sale. The workmen get larger take home pay—easier—like their jobs better, reducing absenteeism and turnover. And the smoother, more even, more continuous production means bigger profits, larger dividends for you. Can we send you more details?

Bulletin No. 91
sent on request

THE C. O. BARTLETT & SNOW CO.

6201 HARVARD AVENUE • CLEVELAND 5, OHIO

ENGINEERING REPRESENTATIVES IN THE PRINCIPAL CITIES

FOUNDRY SAND, MOLD AND CASTINGS HANDLING

HANDLE FOUNDRY SAND EASIER

Save Manpower — Speed Production with P&H Single Line Grab Buckets

Hang a P&H Single Line Grab Bucket on a regular crane hook and it's ready for service. It works with any crane — without changes in cable reeving — without complicated hook-ups or switch-over delays.

You can whip your manpower problems in a hurry when P&H Single Line Grab Buckets are used for handling sand, refuse, and other foundry materials — for digging pits, filling flasks, etc. They break "bottlenecks" in handling and cut costs as well.

Time-tested features insure perfect balance. Equalized bowl operation results in a full bite at every bite. The P&H patented wedge action trip-lever feature prevents recoil, eliminating shock damage to bucket, cable, and entire hoisting unit. Simplified design and sturdy construction in every detail assure long trouble-free service.

Write for Descriptive Folder

Why P&H Single Line Grab Buckets excel in foundry service is demonstrated in Bulletin C-27, which shows how they are built and how they operate, and gives dimensional data. A copy will be sent on request—no obligation. *Write today.*

"Controlled Discharge"
Cranes for Cupola Charging

Included in the P&H line — America's largest builder of overhead materials handling equipment — are cranes and hoists that permit charging of cupolas at any level for better melting control. . . . Write for information.

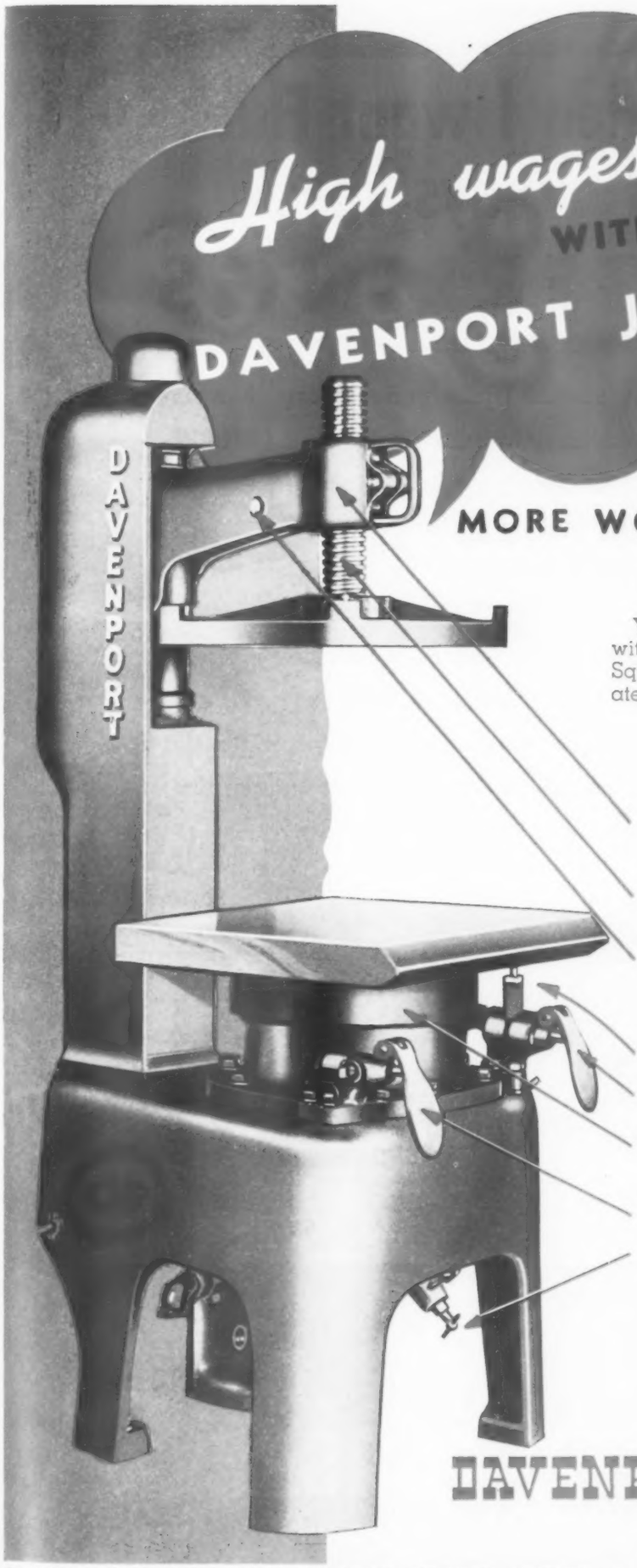
P&H SINGLE LINE GRAB BUCKETS

Gen. Off.: 4405 W. National Ave., Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION

HOISTS · WELDING ELECTRODES · MOTORS · P&H · EXCAVATORS · ELECTRIC CRANES · ARC WELDERS

High wages CAN BE OFFSET WITH THE NEW DAVENPORT JOLT SQUEEZE



MORE WORK...BETTER MOLDS
in less time

You can increase your man-hour production with the new fast-working Davenport Jolt Squeeze. It is easy to install . . . easy to operate . . . easy to adjust.

Check over these oustanding Davenport features—

1. **SWINGING ARM** — gives complete accessibility to table
2. **SCREW ADJUSTMENT** — makes possible quick changeover
3. **ELECTRICALLY CONTROLLED PUSH BUTTON SQUEEZE** — increases efficiency of operation
4. **AUTOMATIC LUBRICATOR**
5. **JOLT KNEE VALVE**
6. **VALVELESS JOLT and SELF- CLEANING STRIKING PAD**
7. **VIBRATOR KNEE VALVE**
8. **SQUEEZE PRESSURE REGULATOR**

See this machine on display at the 50th Anniversary Foundry Congress and Foundry Show at Cleveland, May 6 to 10—1946.

DAVENPORT MACHINE AND *Foundry Company*

DAVENPORT, IOWA U.S.A.

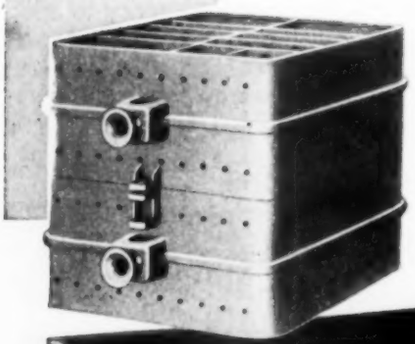
CANADIAN REPRESENTATIVES: CANADIAN FOUNDRY SUPPLIES & EQUIPMENT, LTD., TORONTO AND MONTREAL

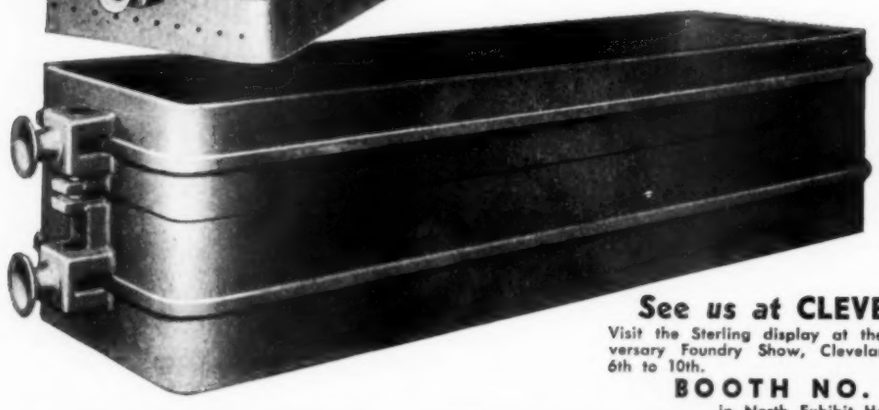
When I want Flasks I always specify STERLINGS

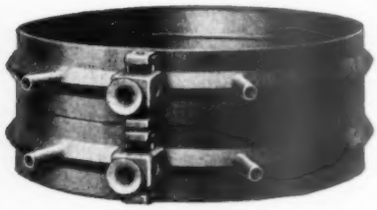
"Why should I take unnecessary chances with ordinary foundry flasks when I KNOW Sterlings can take hard punishment, day-in and day-out for YEARS. Those well-known Sterling features such as *all-welded, rolled steel construction . . . reinforcing ribs . . . square flanges . . . full-width bearing . . .* are features that just can't be beat. What's more, I discovered on the long run, it's actually MORE ECONOMICAL to standardize on Sterlings."

(Patent No. 197429)

Typical features include re-inforcing ribs and flanges . . . all-welded construction . . . solid center reinforcing rib . . . square flanges . . . full width bearing.







See us at CLEVELAND

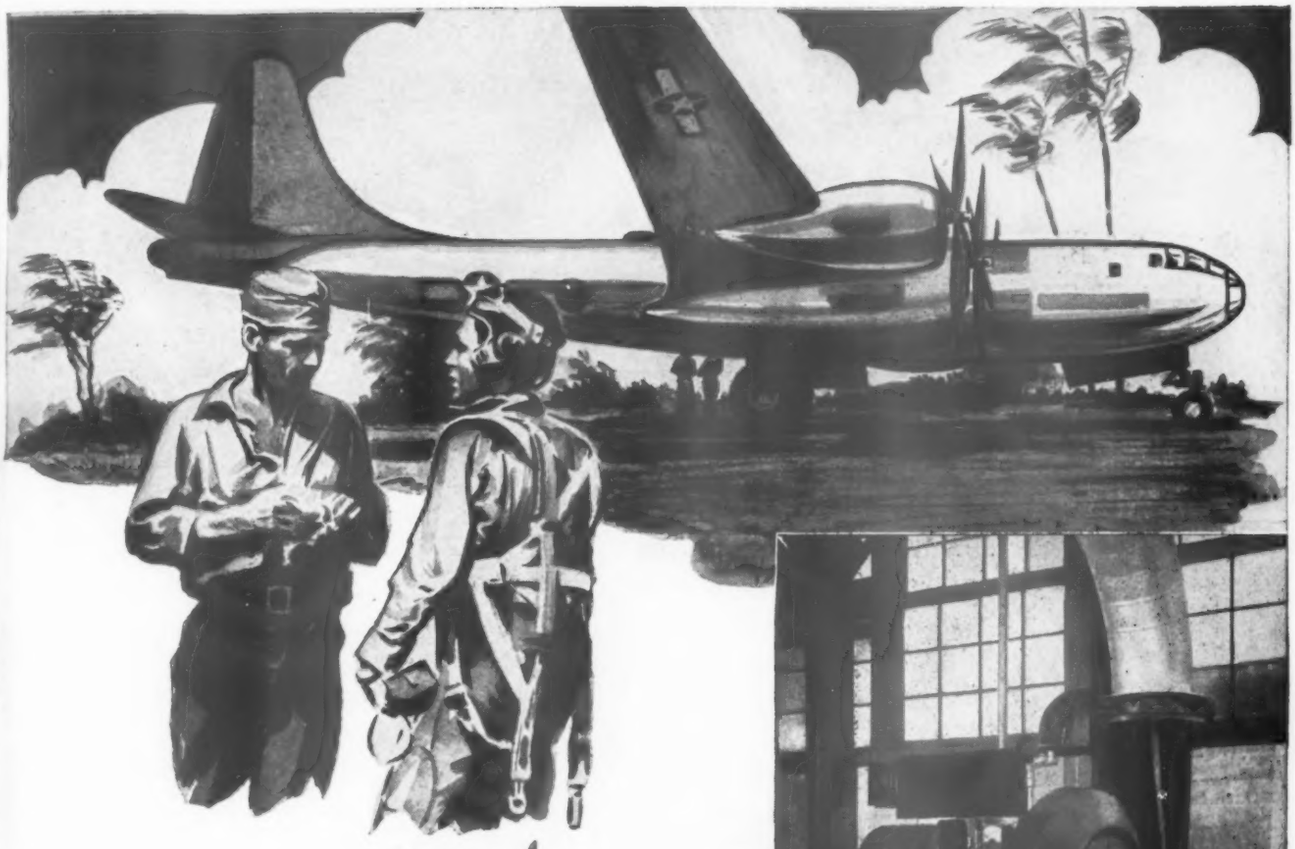
Visit the Sterling display at the Golden Anniversary Foundry Show, Cleveland, Ohio, May 6th to 10th.

BOOTH NO. 509
in North Exhibit Hall

Sterling FOUNDRY FLASKS

STERLING WHEELBARROW COMPANY • MILWAUKEE 14, WIS., U. S. A.

A 4244-1P-R



"We will take on 300 TONS OF AIR ENROUTE"

Although we do not normally think of air in terms of pounds and tons, it does have weight. A Superfortress, for instance, will pass *300 tons of air* through its engines during a round trip from the Mariannas to Tokyo.

We sometimes forget the importance of air weight in connection with other combustion processes. For example, many foundries still use traditional rule-of-thumb adjustments to control the air blast going to the cupola, even though the oxygen content of a cubic foot of air is notoriously variable due to changes in temperature and barometric pressure.

Ingersoll-Rand's automatic control keeps constant the weight of air going to the cupola. Every foundry can now maintain precise control of its air blast. This eliminates human errors and assures "hot" iron every day, regardless of weather. Moreover, it achieves important savings in coke.

Whenever you have a problem involving compressed air machinery, let us help you.

Motorblowers are so designed that power consumption varies directly with the weight of air delivered. The constant-air-weight control maintains power consumption at any desired setting. Thus the weight of air delivered is accurately controlled.

12-673

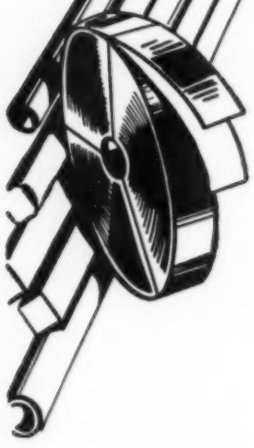
Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

COMPRESSORS • CONDENSERS • TURBO BLOWERS
CENTRIFUGAL PUMPS • ROCK DRILLS
AIR TOOLS • OIL AND GAS ENGINES

HOW TO GET BRASS MILL PRODUCTS!

BRASS, BRONZE AND COPPER... Rod, Bar, Sheet, Strip, pipe, tubing, and wire in Production Quantities.



GOVERNMENT-OWNED SURPLUS STOCK

in many standard and non-standard grades, finishes, sizes and specifications AVAILABLE NOW in production quantities

—and new surplus declarations are being made daily.

EASY TO FABRICATE... This stock may be fabricated by normal production methods.

HOW TO PURCHASE

1. Estimate, for any convenient period, your production needs in each specification, finish, gauge, etc.
2. Write, wire or phone that information to your nearest War Assets Corporation office* below. We will advise you of the location and condition of the stock you need, estimate possible delivery dates, quote prices and help arrange credit.
3. When satisfactory arrangements have been made, we will start shipments.

***WAR ASSETS CORPORATION** is a Reconstruction Finance Corporation subsidiary. When checking telephone and other directories, simply look up RFC.

VETERANS OF WORLD WAR II: To help you in purchasing surplus property from War Assets Corporation, a veterans' unit has been established in each of our Regional Offices listed below.

A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION for Surplus Producers' and Capital Goods, Aircraft and Plants formerly handled by Reconstruction Finance Corporation . . . and for Surplus Consumer Goods formerly handled by United States Department of Commerce.

WAR ASSETS CORPORATION

(A SUBSIDIARY OF RECONSTRUCTION FINANCE CORPORATION)

RFC OFFICES (INCLUDING FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES) LOCATED AT: Atlanta • Boston • Chicago • Denver • Kansas City, Mo. • New York • Philadelphia • San Francisco • Seattle • OTHER RFC SURPLUS PROPERTY OFFICES LOCATED AT: Birmingham • Charlotte • Cleveland • Dallas • Detroit • Helena • Houston • Jacksonville • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • Oklahoma City • Omaha • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • Spokane • OTHER FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES LOCATED AT: Cincinnati and Fort Worth

157-4

"I FOUND a way to save $24,480.00 in my *Wastebasket*"

"Something caught my eye in the wastebasket . . . a trade journal I had flipped through and discarded. It was turned up to an ad which promised a 46% saving in material handling costs. When they talked about cutting my handling costs that much, well, I wanted to be shown.

"Literature told how this saving could be accomplished simply through the use of a bright, shiny orange and black electric truck called 'Transporter' . . . the miracle truck that lightens life's loads. It was an impressive story. As a result I ordered one, and an A.T.C. Specialist showed up with it to demonstrate what they claimed.

"He piled 6000 pounds of our most unwieldy product on it. Then asked for one of our stenographers . . . and she promptly walked off with the load as easy as she'd powder her nose. Her thumb pressed a button, her hand gently guided it. That's all there was to it. Husky truckers accustomed to a three-man operation moving similar loads were amazed . . . couldn't wait to try this wonder truck that meant for them an end to back-breaking, gruelling toil.

"I was more than sold on Automatic Transporters. They have cut our material handling costs 46% . . . a solid $24,480.00 saved*—the equivalent of $244,800.00 worth of increased volume on a 10% profit basis. That's the money-saving, profit-making opportunity I found in my wastebasket."

Such savings may be duplicated many times over during the life of Transporters . . . may be multiplied many times depending on the size of your material handling operation. Mail the coupon for complete facts.

Remember: Only AUTOMATIC Makes the TRANSPORTER

"Transporter
A PRODUCT OF AUTOMATIC
Lightens LIFE'S LOADS

*Case 10 in "Automatic Savings Parade"

AUTOMATIC TRANSPORTATION COMPANY
Div. of The Yale & Towne Mfg. Co.
121 West 87th Street, Dept. D, Chicago 20, Ill.

Please mail me, without cost or obligation, complete facts about AUTOMATIC TRANSPORTER, the miracle electric truck . . . plus *proof* that it has cut handling costs in half.

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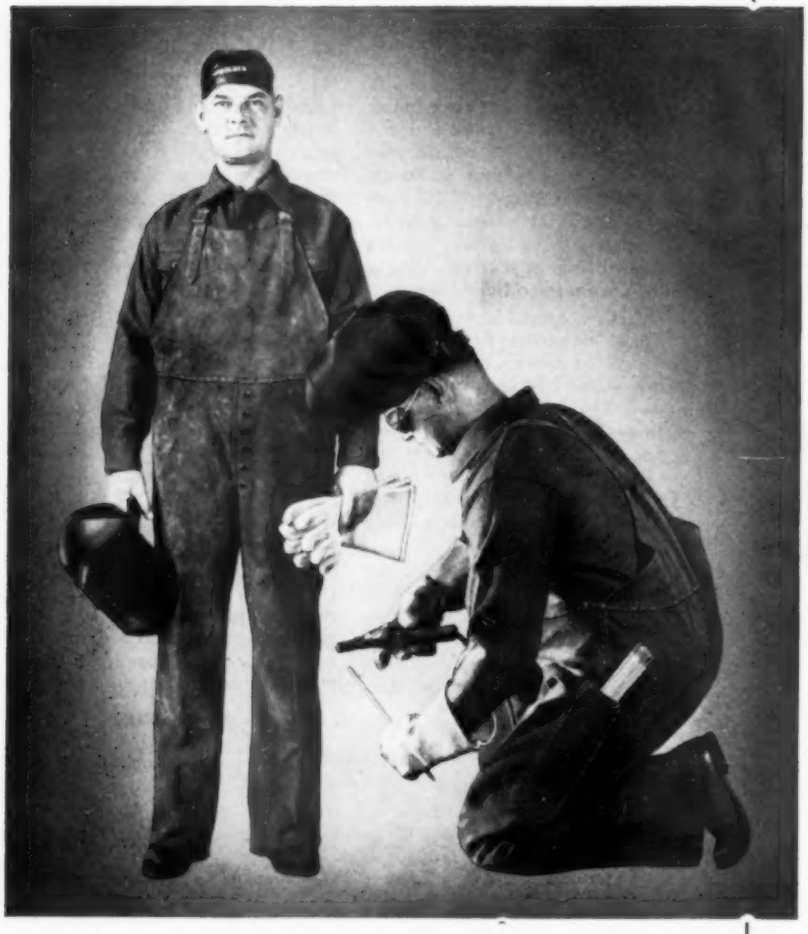
AO

Welders' Safety Clothing

FOR COMFORT,

SAFETY,

EXTRA LONG WEAR



AO OVERALLS NO. 207-CL. Made from high quality chrome-tanned cowhide, this garment is shaped to fit comfortably and give unusually long service. Trouser legs are 24" wide at the bottom, making them easy to put on and take off over heavy shoes. Ample roominess in the crotch enables the operator to stoop over or handle floor-level jobs comfortably. An 11" wire pocket on left leg; one hip pocket with flap; chrome leather shoulder straps with buckles for rapid adjustment; large one-piece bib for full chest protection. Send for complete information.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS

Materials. To minimize the possibility of shriveling and shrinkage, AO Welders' Clothing is made of the highest grade of chrome-tanned cowhide, weighing approximately 4 ounces per square foot. All leather received at AO Factory has been subjected to laboratory analysis for excess shrinkage, abrasive resistance, proper chrome-tanning, and correct grease content.

In areas of extra tension and strain, reinforcing rivets provide added strength and longer garment life. The fire-resisting duck used for backing weighs approximately 12 ounces per square yard.

Fasteners. AO Welders' Safety Clothing is equipped with the finest fasteners obtainable — large, durable snap fasteners. They are easy to open and close, stand up under hard service, and are generously used to insure tight closures.

Sleeves of ordinary welders' clothing have seams like this.

Sleeves of AO Welders' Coats and Cape Sleeves have *flat* seams like this.

Seams. Welders' leathers normally wear out or give way at the seams. AO Welders' Safety Clothes have very few seams, and these seams, wherever possible, are located well away from the line of fire. All seams are double cotton stitched and reinforced with metal stitching. To prevent irritation, the sleeves of AO Coats and Cape Sleeves have *flat* seams. This construction also provides strong, sturdy resistance to wear at the elbow.

Crotch. Closely spaced rivets reinforce AO Pants and Overalls from the inseam of the leg to the fly, strengthening the first area in which *all* trousers usually give way or wear out. To prevent sparks from rolling through, the fly has ample overlap and plenty of snaps placed closely together.

HIGH YIELD STRENGTH

FRONTIER ALLOY "40-E"

A HIGH STRENGTH ALUMINUM *Alloy* THAT NEEDS NO HEAT TREATMENT

The ALLOY that has ALL 6

1. **Shock Resistance**—Tests have proved its exceptional ability to withstand explosive shock and standard impact shock.
2. **Corrosion Resistance**—Excellent, not only in standard corrosion tests but also under stress.
3. **High Yield Strength**—A dominant factor where distortion or misalignment of parts would make the assembly inoperable.
4. **Machineability**—Far superior to the usual sand cast aluminum alloys and machined parts have a high lustre.
5. **Pressure Tightness**—The fine grain of the alloy enables it to withstand high pressures.
6. **No Heat Treatment**—Physical properties are obtained by natural aging at room temperatures.

High yield strength is of utmost importance in castings subjected to severe stress and impact. This is especially true where distortion of the casting would render it functionally inoperative. Frontier "40-E" is notably high in yield strength—adaptable to many types of castings designed for exacting service conditions. In addition to its high yield strength, Frontier "40-E" also provides high tensile strength and elongation—properties attained through natural aging.

ENGINEERING DATA ON REQUEST

The Frontier Alloy Data Book brings pertinent engineering and metallurgical facts on the physical properties of "40-E". In writing for your free copy, please state company name, your title, and address.

Licensing franchises now available in certain areas to meet the increasing demand for Frontier "40-E" Alloy. Details on request.

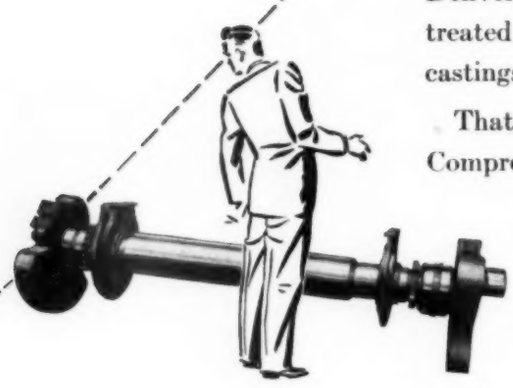
Specifications — Army-Navy Aeronautical Spec. AN-A-17; U. S. Navy Bureau of Ships Spec. 46A-1 (INT), Class 1, A. S. T. M. Spec. B26-42T, Alloy ZG-41, S. A. E. 310.

Typical Physical Properties—tensile strength, 35,000 psi.; yield strength, 25,000 psi.; elongation, 5% in 2".

FRONTIER BRONZE CORPORATION

★ 4878 PACKARD ROAD ★

NIAGARA FALLS, NEW YORK



Here is the main crankshaft of a Gardner-Denver Class "HA" Horizontal Air Compressor. Notice those Timken roller main bearings—an exclusive Gardner-Denver feature. The shaft is a steel forging, heat treated and finished all over. The crank discs are steel castings and counterweights are cast integral.

That crankshaft tells you a lot about an "HA" Compressor—because it is typical of the kind of construction used throughout. That's why the "HA" is a *heavy-duty* compressor in every sense of the word. That's why it gives year after year of continuous service—24 hours a day if you like—with a bare minimum of maintenance.

You can learn a lot about a compressor from its crankshaft!

If you're looking for a compressor that's a standout for service—and a miser on costs—let us tell you more about the "HA". For complete information, write Gardner-Denver Company, Quincy, Illinois.

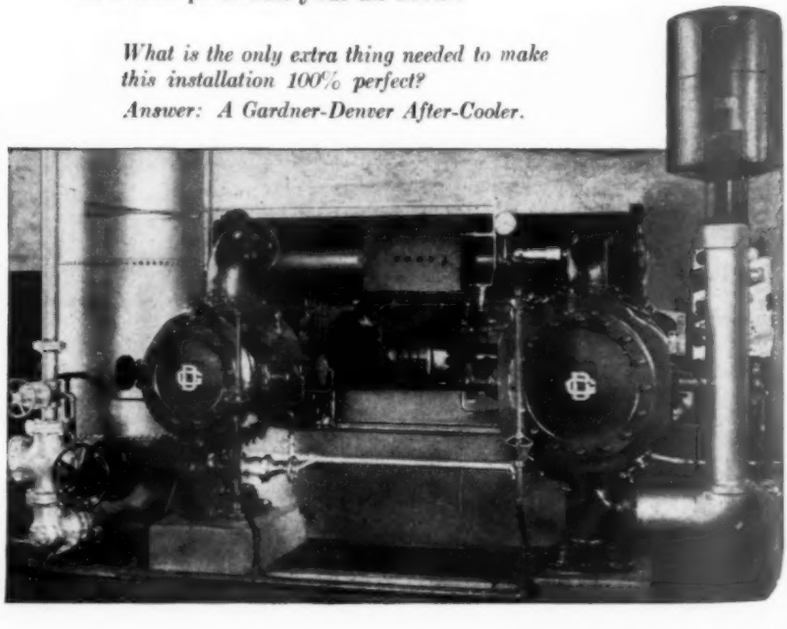
OTHER "HA" FEATURES

- Air cylinders designed for highest volumetric efficiency and lowest horsepower requirements.
- Large water jacket areas for cooler-running . . . lower discharge temperatures and lubricating economy.
- Duo-plate "cushioned" valves for high delivery capacity, high compression efficiency and lowest power consumption.
- Five-step capacity control regulates air output in five steps to suit your air needs.

GARDNER-DENVER

Since 1859

What is the only extra thing needed to make this installation 100% perfect?
Answer: A Gardner-Denver After-Cooler.



Gardner-Denver Class "HA" Two-stage Horizontal Compressor. Available in capacities from 316 to 2012 cubic feet displacement per minute.

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...dependability and uniformity in metal chemicals

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PICKLING . . . Sulfuric Acid—Hydrofluoric Acid—Muriatic Acid—Nitric Acid—Phosphoric Acid—Chromic Acid.

Detergents: Sodium Metasilicate—Trisodium Phosphate—Sodium Silicate—Tetrasodium Pyrophosphate.

RIMMING STEEL . . . Sodium Fluoride for smoother surface rimming steel.

COKE BY-PRODUCTS . . . Sulfuric Acid for making Ammonium Sulphate; for washing toluene, benzene, and for treating light oils.

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Casting Cleaning Acid (Hydrofluoric Acid)—Sodium Silicate—Zinc Chloride—Polyacid Fluorides—Chromic Acid.

Sodium Fluoborate—Ammonium Fluoborate—Potassium Fluoborate, anti-oxidants and inhibitors.

Potassium Fluoride—Lithium Fluoride and other welding fluxes.

Fluoboric Acid: Solvent for silica, in cleaning surfaces.

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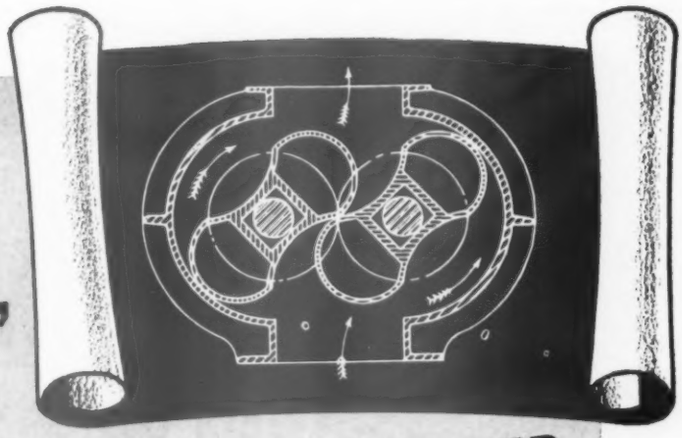
HERE'S the "INSIDE STORY" of the POTTSTOWN AIR BLOWER



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Supercharging and Priming
Vacuum and Rug Cleaning

OR — wherever AIR or GAS is to be moved at any pressure between 1/2 and 12 psi or equivalent vacuum.

Notice how the two inter-engaging impellers of the POTTSTOWN Rotary Blower rotate in opposite directions. The concave portion of each impeller alternately carries along a pocket of clean air as it passes over the bottom inlet. This impulse of air is swept half around the interior of the casing wall and then forced through the top outlet. At operating speeds these alternating impulses merge into a continuous flow of air. The impellers are inter-engaged by timing gears operating in an external sealed-case oil bath.

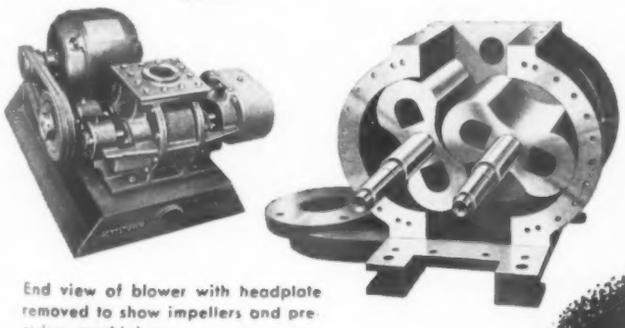
Efficient positive displacement is accomplished with POTTSTOWN Blowers because their precision machining permits close tolerances of only .003" on moving parts. Their efficiency is maintained during long life because there is no actual contact or surface friction between the impellers themselves —nor between impellers and casing interior. No *wearing parts here!*

With friction eliminated, interior lubrication is unnecessary. Only clean air — uncontaminated by lubrication — is delivered to your air lines. No valves, springs, pistons, sliding vanes, or other friction parts to wear out or cause repairs. *THAT'S the inside story of the POTTSTOWN Blower!*

Simplicity of design — sturdy construction — precision machining — THESE FEATURES eliminate maintenance and adjustments, even on daily 24-hour service!

Write today for our new Bulletin No. P-100.

AB—824



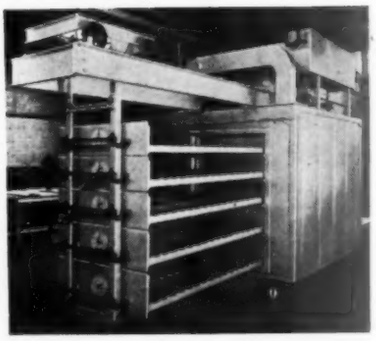
End view of blower with headplate removed to show impellers and precision machining.

POTTSTOWN
ROTARY POSITIVE DISPLACEMENT
BLOWERS AND EXHAUSTERS

MANUFACTURED BY
ALLEN BILLMYRE COMPANY
493 Fayette Avenue, Mamaroneck, N. Y.

FROM CORES TO FINISHED CASTINGS

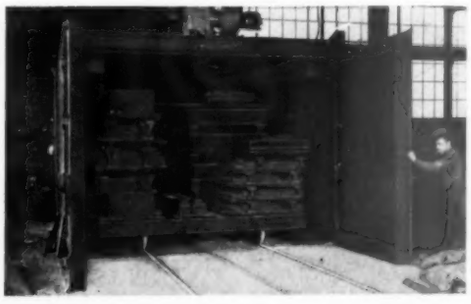
YOU INSURE QUALITY of HEAT TREATMENT with GEHNRICH OVENS and ROCKWELL FURNACES



Gehnrich Pull-drawer Oven for core baking or heat treating; heated by gas or oil heater-air recirculation system.

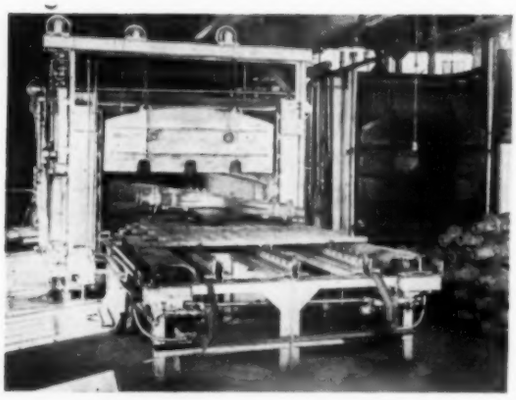
The extensive experience of the Gehnrich-Rockwell organization is your assurance of getting the right oven or furnace for your heating job. Hundreds of installations of Gehnrich Ovens for core and mold drying, low temperature heating or metal finishing, and of Rockwell Furnaces for non-ferrous metal melting or for annealing and heat treating of castings, are doing excellent work in foundries, large and small.

Let us send you our folder of bulletins.

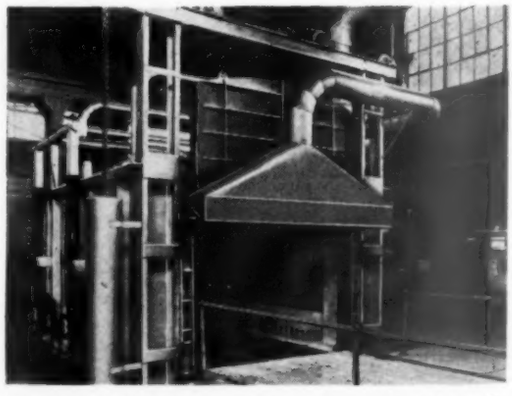


Gehnrich Car Type Mold Oven—single or multiple compartment—assures drying uniformity through internal recirculation heating.

Gehnrich Monorail Conveyor Oven with preheating and baking zones, heated by external gas-fired air heater - recirculation system, for core baking.



Rockwell Pusher-Tray Furnace, gas-fired, for annealing large castings; handling system and heat control entirely automatic, saving labor and improving metal uniformity.



Rockwell Car-Bottom Furnace with oil-fired, bridge-wall heating system for uniform annealing of castings.

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W. S. ROCKWELL COMPANY • 210 ELIOT STREET • FAIRFIELD, CONN.

SAVE
EXTRA HANDLING!

USE CMD *DUAL-PURPOSE CORE TRAYS*

The CMD Dual-Purpose Core Tray can be used for baking the cores, thus eliminating transfer of cores from core plate to core tray.

Because of their lock-stacking features, these trays make possible storage from the floor up. Bins and racks are no longer necessary.

SPECIFICATIONS

SIZE—12" X 24"

LOADING HEIGHT—4½"—6" OR 7"

OVERALL HEIGHT—5½"—7" OR 8"

WEIGHT—9½ POUNDS

MATERIAL—16 GA. SHEET METAL

SPOT WELDED (28 POINTS)

ALL ROUNDED CORNERS

2 BOTTOM REINFORCEMENT ANGLES

CONSTRUCTED FOR STACKING

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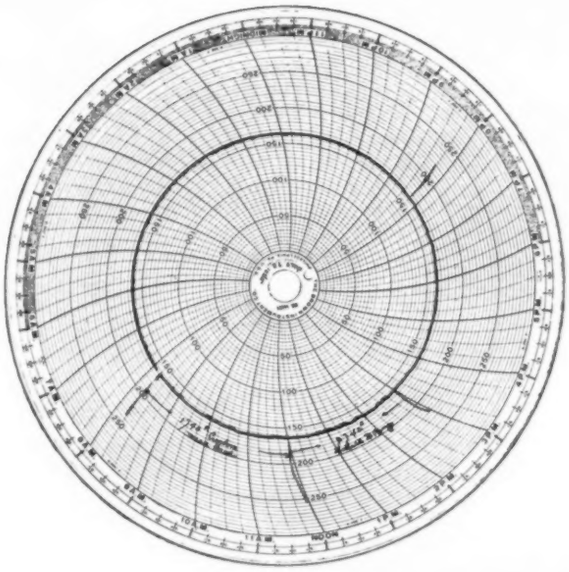
of **GAS** and **MODERN GAS EQUIPMENT**



precise,

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No other fuel for the industrial production line, where heat application in any form is required, lends itself so well to control of combustion and temperature as does Gas. The rate of flow, which determines heat input, may be varied over wide limits, at an infinite number of intermediate points.

Gas may be burned at the rate needed for the minute flame of a jeweler's torch. It may be fired at the tornadic intensity required in a furnace to heat treat steel billets 10 inches in diameter at 2250° F. In between and at even higher temperatures it is called upon to do scores of other jobs where temperature readings from control panels of Gas equipment show a fidelity to exactness that is unequalled in heat treating.

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FOR ALL
INDUSTRIAL HEATING

NEW FEDERATED LABORATORY

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Research and laboratory control has always played a vital part in Federated's operation, production and service. This new $100,000 laboratory, fully equipped with the most modern physical testing apparatus and spectrographic equipment, enhances our ability to control the quality of Federated aluminum, brass and bronze, babbitt, solder, type metal, die casting alloys and zinc dust and aid in the solution of our customers' problems.

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Increase Production

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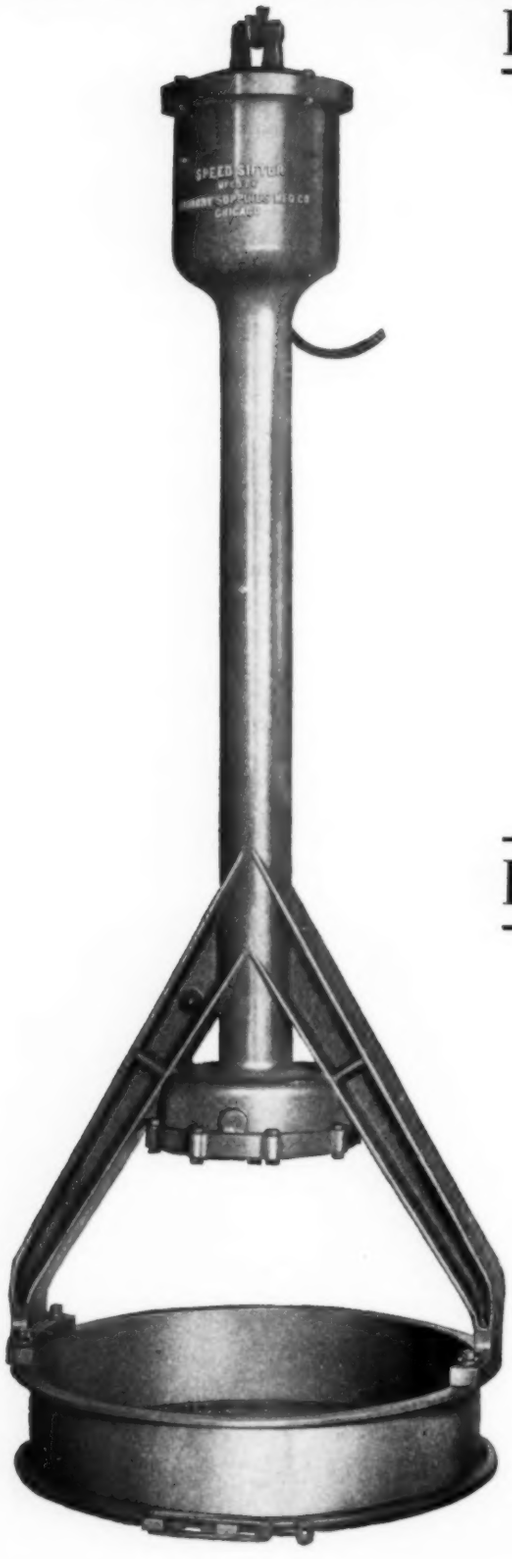
ROTOPLANE SPEED SIFTER ★ RED ELECTRIC VIBRATORS



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The ROTOPLANE Speed Sifter is an *improved* sand riddle of much greater capacity and much longer life. One size and type serves all purposes in the foundry—does *all* your sifting more quickly and economically.

It is easily handled by one man, weighs approx. 90 lbs., is 62 in. high overall. The one-piece frame of tough aluminum alloy makes for a remarkably effective vibration. Its smooth, free, rotary action vastly increases bearing life; all bearings grease packed. All mechanism of the ROTOPLANE is *completely* enclosed—no bearings or activating parts of any kind exposed to dust and grit.

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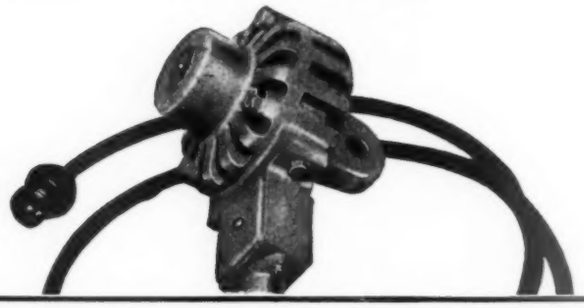
$175.00 f.o.b. Chicago—complete with cable, safety ground wire, new sieve (2 to 4 mesh). Standard ⅓ h.p. motor, 115 or 230 volt, 60 cycle, single phase.



RED ELECTRIC VIBRATORS

True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work	$10.00
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No. 5—Heavy match plate, tub and bench work	17.00
No. 9—Machine and heavier work	24.00

Third (ground) wire per U. S. Govt. code—furnished with No. 9 at no extra cost; $1.00 extra with Nos. 1, 2 and 5 vibrators.

KNEE SWITCHES for operating Red Electric Vibrators: Single pole $3.00, Double pole $4.00.

FOUNDRY SUPPLIES MANUFACTURING CO.

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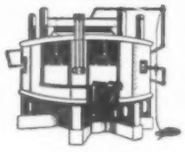
FOR SALE

SURPLUS HEAT-TREATING FURNACES of practically *every size* and *type* for ferrous and non-ferrous applications: normalizing, annealing, tempering, hardening, case hardening, surface hardening, nitriding, cyaniding. Oil—Gas—Electric. Continuous and batch types. Any changes in these furnaces necessary to meet normal production needs will be considered in pricing this equipment.

You can acquire *now* at good value, long needed production equipment—such as the heat treating furnaces shown in this advertisement. Check your operations today. Find out where additional or replaced equipment would cut your costs or speed processing. Then go over your needs with your nearest War Assets Corporation Regional Office*. From the vast quantities of surplus industrial equipment on hand you will be able to pick, in all likelihood, exactly what you need at a very low price.

**In directories simply look up Reconstruction Finance Corporation. War Assets Corporation is an RFC subsidiary.*

VETERANS OF WORLD WAR II: To help you in purchasing surplus property from War Assets Corporation, a Veterans' unit has been established in each of our regional offices.*



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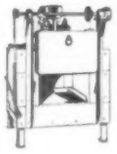
For heat treating in production operations. Semi-automatic operation and control.



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For tempering small work in production or for the tool room or laboratory.

INDUCTION HARDENER

The latest development in controlled surface hardening by high frequency induction. A complete heat-treating unit that can be spotted strategically in the production line.

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Without obligation, make sure your name is on the list for complete information on the types of industrial equipment you need. Simply mail this coupon.

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• ACME ALUMINUM ALLOY CASTINGS

*TRIPLE-A Almag 55 provides the extra strength and elongation required for this aluminum part.

Announcing TRIPLE ALMAG 55

A *LIGHT* METAL IN WEIGHT . . . A *HEAVY* METAL IN STRENGTH

HERE is a new aluminum castings alloy with a tensile strength of 50,000 to 60,000 pounds per square inch. It is far stronger than gray iron—approximates the strength of malleable iron. And it has a remarkable elongation of 15% to 30%. Called *TRIPLE-A Almag 55, and produced by Acme alone, this new alloy is truly a heavy metal in strength. Yet, it has the light weight of an aluminum magnesium alloy.

No matter what metal you now use, ask about Acme Aluminum Castings made of Almag 55. This new alloy may bring to *your* product the light weight—the corrosion resistance—the free machining—and the silver-bright surface that only aluminum gives.

Remember, too, there are no finer castings— sand or permanent mold—than those coming from Acme's big, modern, light-flooded foundry. There the most advanced castings techniques are backed by 25 solid years of foundry experience. For full information on how today's aluminum alloy castings made for today's demands may be applied to your product problems, get Acme's recommendations without obligation.

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Foundries Still Need United Organization

ON FREQUENT occasions in the past, THE FOUNDRY has stressed the need of an overall organization of foundry groups to fight for the best interests of the great industry which is engaged in the production of castings.

For example, in December, 1941, when we were just entering the war, this publication stated editorially: "The war effort and the foundry industry of the United States both need a Council of Foundry Associations of America. Such a group could develop to best advantage the fundamental principles of a basic industry serving a nation at war, and could influence trends in the foundry industry as a whole and in the various component branches. Study of the problems of each branch in the light of requirements of the various groups should prove most valuable to all and provide maximum efficiency in the present emergency."

Although an earnest effort was made by a number of leading foundrymen to get all of the various foundry organizations to think along these lines, and several meetings were held at which some progress was made, a certain amount of jockeying for the pole position resulted in abandonment of the project. THE FOUNDRY still believes that if such an organization had been established in the early days of the emergency, production of castings for war might have functioned smoother, and many of the problems carried over from the war years or developing since the surrender of Japan might have been eased considerably or perhaps eliminated entirely.

The need for co-operative effort on the part of foundry organizations—both technical and trade associations—is as great today as it was during the war period. Now such an organization could be concerned with the problem of assuring the foundry industry a place in the industrial picture commensurate with the importance accorded its products in the scheme of modern civilization. Co-operation should strengthen the position of castings in the competitive era which lies ahead.

With a united front for the industry, relationships between foundries and the various government regulatory bureaus could be established on a basis much more satisfactory to the producers of castings. As long as Washington is controlled by pressure groups, the combined force of all branches of the foundry industry should be employed in stating the case for castings. For instance, a group of foundrymen speaking for all foundries in the United States might be more successful than the various divisions of the industry in making the Office of Price Administration understand that individual companies producing castings cannot give wage increases (encouraged by government) and pay more for raw materials (regulated by government) and still sell castings at the ceiling prices in effect prior to these increases in production costs.

Producers of castings need a united foundry organization now if the foundry industry is to prosper and solve present and future difficult problems. Such an organization could function without interfering in any way with existing associations and societies and the important services they now render the industry.

Frank G. Steinebach
Editor

What th

W. O. LEONARD
President
Wilson Foundry & Machine Co.
Pontiac, Mich.

Management's efforts to improve industrial relations are made more difficult unless it knows what the employees honestly think of their jobs. How one company proceeded in its attempts to obtain this information, and some of the results of its study, are detailed here

MANAGEMENT frequently has wondered what the average employee thinks about his job—how he regards working conditions, his foreman and the company's policies; how he feels about the many other things which can make a worker either satisfied or disgruntled. Officials of the Wilson Foundry & Machine Co., Pontiac, Mich., had the same questions in mind and decided to do something about it. So, in effect, each of the company's employees was asked, "How do *you* feel?"

The query was in the form of a questionnaire covering a variety of subjects that ranged from "What do you like least about the company?" to "What new products, in your opinion, could we manufacture successfully after the war?" The questionnaire was purposely designed so that the respondents could express their opinions freely without being identified. No signature was required. As might be expected, the replies were a mixture of compliments and criticisms, but they added up to some helpful and significant information.

The company has consented to publication of the consensus of the returns from the questionnaire, not because it feels that the workers' opinions put it in a particularly favorable light, but because these views offer some insight into the thinking of the average employee today and may be of some assistance to other foundries in the solution of their industrial relation problems.

Wilson's questionnaire was made up into an attractive booklet with an eye-catching cover, and the following first-page message from W. O. Leonard, president:

"We've grown pretty fast here at Wilson's in the past few years. There was a time when I knew personally almost every man and woman in our organization. I then had an opportunity to talk to you from time to time—to exchange ideas and to find out just how you felt about your job and about our Company.

"War and our rapid expansion has necessarily changed all of this. I'm sure you realize that it is now a physical impossibility for me to carry on as before. Nevertheless, I more than ever want and need your ideas and I still would like to know your personal feelings about your job and Company.

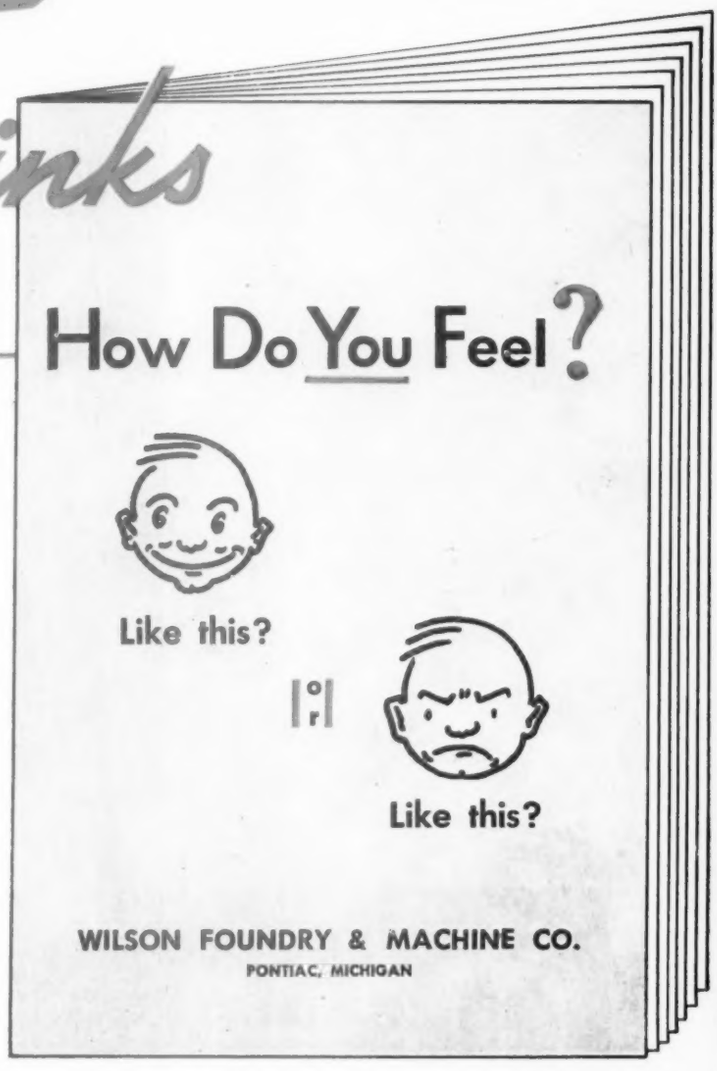
"I have, therefore, prepared a list of questions to help me get your ideas and your thinking. I hope you will read each question carefully before answering, and above all be perfectly frank, for I want the truth and I know you will be fair.

"Please do not sign your Questionnaire or identify yourself in any way. I have arranged with the University of Michigan to tabulate and analyze your answers, so when you have completed the questions, mail the booklet direct to Ann Arbor. A stamped, addressed envelope is enclosed for this purpose.

"I feel certain that your answers and comments will help me immeasurably in shaping the plans and policies under which we all must work and live in the future. Thank you very much for your co-operation."

Results of the survey, compiled and analyzed by Edgar H. Gault of the University of Michigan's School of Busi-

th Worker Thinks



Each employee received a copy of this questionnaire to be answered without signing his name

ness Administration, comprise a 110-page report. While the entire report cannot be reproduced here, some of the more pertinent observations will be mentioned. The general conclusions drawn by Mr. Gault give an overall summary of the replies, as follows:

"The composite picture presented by the replies is that of a company improving its position in its field and having good aggressive management at the top. On the basis of the replies, the company could be rated as slightly better than average. This may actually represent superior performance since bias toward management on the part of rank and file who live in a continual atmosphere of labor propaganda might prevent any company with the same type of employees from securing a higher rating.

"The employees have the idea that wages are relatively low. They favor an incentive pay plan but many think incentive pay is figured unfairly and inaccurately.

Suggestions for Improvement

"The respondents think working conditions are above average. They think their working hours are about right and like the greater freedom they have at Wilson's in comparison with some of the other factories in Pontiac. Although the employees give the company a good rating on its efforts to provide safer working conditions, they object to the crowding of the aisles with materials and the failure to keep the work places as clean and orderly as they should be. Safety regulations at times are not rigidly enforced.

"Morale is not particularly high in the plant. The external cause may be found in propaganda by unions. Internally it is caused by the working conditions already mentioned plus lack of satisfactory conveniences for the workers' comfort. These include toilet and lavatory facilities, poor foremen, favoritism in promotions, and the cafeteria. This part of the questionnaire gives several worthwhile suggestions for improving plant morale.

"Absenteeism is largely caused by drunkenness and indifference toward the job. These could largely be corrected by improving working conditions and, if possible, by applying stronger discipline to the chronic absentees.

"The replies to the questions on opportunity for advancement, the carrying out of promotion policies, and the quality of general management indicate that, in the opinion of the rank and file, most companies rate pretty low in these respects and, all things considered, Wilson is probably as good as any, and better than most.

"A vast majority favor modernization of the plant's facilities and consider the company's future, as well as their own future with the company, reasonably secure.

"The replies relating to fellow workers reveal a general friendly, co-operative attitude among employees, but a good many of them would make an exception in the case of their foreman, time-study man, or one or two others who push them around.

"Loafing occurs frequently, and, no doubt, reduces morale. Other unsatisfactory conditions which apparently affect morale are job shirking, (*Please turn to page* 223)

Fig. 1—Sand is rammed with long handle pneumatic rammers from top to bottom of the core

Making cast iron

INGOT MOLDS

By PAT DWYER
Engineering Editor
THE FOUNDRY

TO EMPLOY a term which has blossomed into fairly common use through a flood of war literature, ingot mold castings probably are the most expendable of all foundry products. Squatting like grim heathen idols on the floor of the mill, in a long line on buggies, or in groups on a circular plate—they are filled with molten steel and emptied an average of 100 times. Then their brief life is over. They are smashed to charging box size under the skull cracker, loaded into a train of charging pans and dumped into the flaming maws of hungry furnaces and converted into steel to be poured into their successors.

Some twenty-odd years ago, the Bethlehem Steel Co. erected and equipped a foundry designed especially for the production of ingot molds for use in the local or Lehigh plant and in several other recently affiliated plants, with the exception of the Lackawanna plant in Buffalo which produces all the molds required for its own use. Original estimate indicated that a production of approximately 200 tons per day would meet all requirements, including a comfortable margin to take care of outside business. As with the classic example of many men "Who do not know their own strength" until subjected to an apparently impossible test, the foundry working around the clock during the recent feverish wartime demand for steel and more steel, turned out 700 tons of ingot molds per day. In addition to molds for its various plants, the company has shipped approximately 30 per cent of the product far and wide, including shipments to the Pacific coast.

The fireproof ingot mold foundry building, 272 x 550 ft, with brick walls, steel frame and cement slab roof, is supplemented by a roofed stock yard, 75 x 275 ft, and an adjoining department on the east side of the main building where the castings are given a final inspection and loaded on railroad cars for shipment. This department is equipped with one 40-ton and three 25-ton capacity cranes. Three 25-ton capacity cranes handle the flasks in the molding section of the foundry. A 100-ton capacity crane lifts the blast furnace ladles and transfers the contents to a 400-ton capacity tilting type mixer.

Special large ingot molds in weight up to 55 tons are molded in pits in the floor according to regular jobbing shop technique. Other molds in wide variety of shape, size and weight—round, square, rectangular, plain and fluted, 6 x 6 in. to 22 x 80 in., and from 1000 to 34,000 lb —are molded in cast iron flasks with cast iron core barrels covered with an inch or two of sand to form the inside.

Individual and exceptionally large molds are made in the gray iron foundry described and illustrated in the February issue of the THE FOUNDRY. What is claimed to be the largest and heaviest ingot mold casting in the world was made in the Bethlehem Steel Co. gray iron foundry about a year ago. Dimension of this 200-ton casting include 9 ft 3 in. wide, 16 ft 7 in. long and 13 ft 9 in. deep.

In the ingot mold foundry, the molds are made in a row of pits along one side. The operators stand on the floor or on planks extending from side to side of the pit. The method presents advantages and disadvantages as compared with the method practiced elsewhere where the flasks remain at floor level and the operators stand on elevated platforms. The subject has served as the basis for many interesting debates among men engaged in this branch of the foundry industry. As with many other phases of foundry practice, the debaters retire with original convictions intact. And as with debates of any and all kinds, the outsider blessed with even rudimentary intelligence emulates "Ole Man River, who don't say nothin', but just keeps rollin' along!"

Molds Made According To Various Methods

In some instances the mold and cores are made separately, one from a solid pattern and the other in a wood corebox, split vertically. In some few instances, the hollow pattern serves for pattern and corebox. The base plate and arbor are retrieved from the shakeout floor and returned to the vicinity of the ramming pits. The base plate is lowered into place in the bottom of the pit and the cast iron arbor is fitted into a recess. A key driven through a member which projects through the plate anchors the arbor in place. Sand is ramed in the recess around the arbor and scraped off flush. This thickness of sand serves as insulation and prevents actual contact between the molten iron in the mold at a later period and the metal plate.

The pattern then is set in place, followed by the substantial cast iron flask. A long piece of 2 or 3-in. diameter steel pipe, depending on the size of the casting, is set upright for a sprue in a vertical continuous pocket provided in the flask for that purpose. Sand is shoveled into the space between the pattern and the flask, and between the arbor and the pattern. Two men work on this job. One man supplies a steady stream of sand which the second man rams with a long-handle rammer. The sand is rammed to the top of the pattern and scraped off flush with the top of the flask. No attempt is made to form a joint surface,

Fig. 2—Vent rods extend from top to bottom of the core

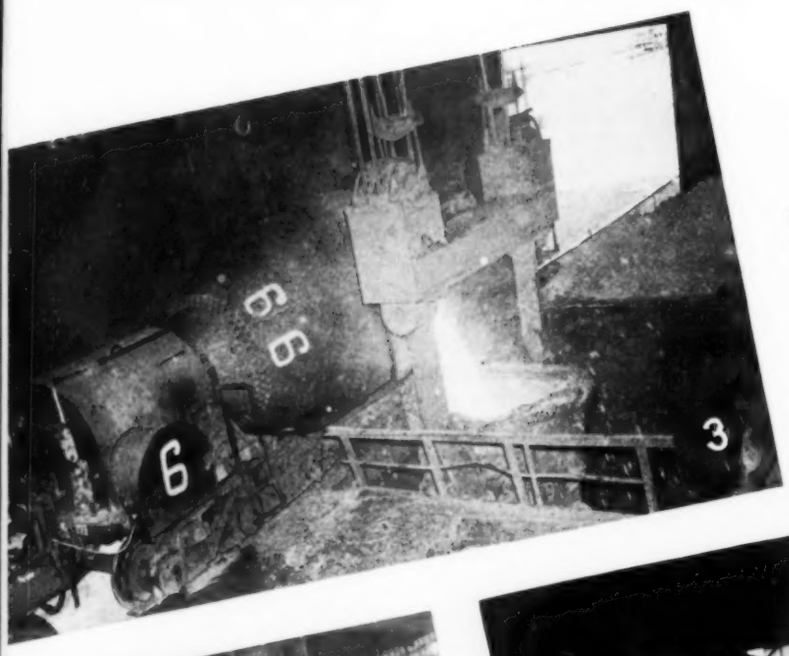
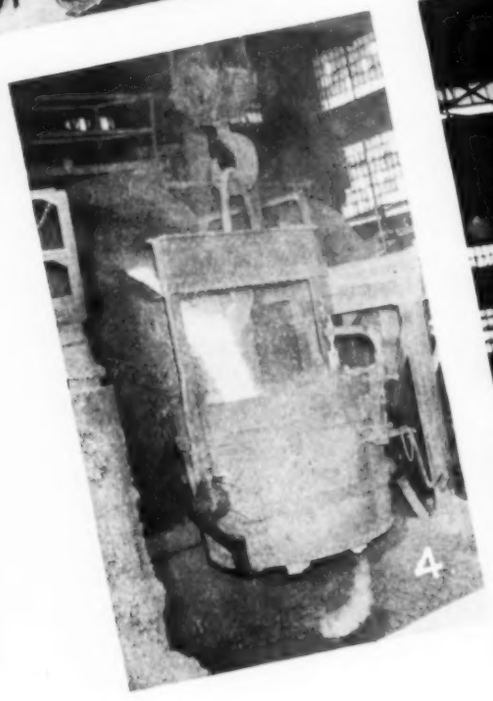


Fig. 3 — Submarine ladle brings direct metal from the blast furnace to the foundry

Fig. 4—The bottom-pour ladle receives metal from a large tilting mixer ladle

Fig. 5—Molds are set up for pouring on both sides of an elevated platform



since no copes are placed on these molds.

An exceptionally strong, coarse and highly permeable sand from a New Jersey deposit, and used extensively by foundries engaged in the production of heavy castings, serves for molds and cores. Old sand from the shakeout station is rejuvenated with a sufficient amount of new sand to compensate for the normal loss. The mixture is screened and mulled and delivered on a conveyor belt to the vicinity of the molding pits, where it is discharged on the floor in a long pile or windrow within easy reach of the men shoveling it into the flasks. Near the beginning of the belt passage, an attendant manipulates a water spray to raise the moisture content of the sand to approximately 6 per cent.

In addition to a strong and refractory sand and an adequate coating of carbon blacking or facing material, ingot mold makers realize through long experience that proper venting of the core is one factor, if not the most important, in securing clean, smooth face on the inside or working face of the casting. Where an occasional scab or buckle or dirty area on the outside might detract slightly from the appearance of an ingot mold casting, this form of defect would not detract from its utility. A similar defect on the inside face would result in rejection of the casting. Steelmakers have no time to waste on *stickers*—ingots with lumps, warts or bunions on the surface which prevent removal of the mold under the stripper.

The former and common practice of using arbors provided with a great number of small vent holes has been discarded. The present arbors are without vent holes of any kind, except a short length of 2-in. diameter pipe at the top. A number of small (*Please turn to page* 240)

A coremaker without a foundry—that is the position of the Coremakers Co., Chicago, believed to be the only jobbing coremaking shop in the country. Well established after nearly four years' operation, the company makes up to 10,000 cores a day in sizes ranging from pin cores to complicated ones weighing 100 lb. It does business within a 200-mile radius with foundries having no coremaking facilities or needing to supplement their own output

CORES for SALE

By ERLE F. ROSS
Chicago Editor
THE FOUNDRY

A NEW form of specialization—the commercial coremaking shop—was introduced into the foundry industry during the war, survived and grew, weathered the initial postwar period, and now is emerging as an established peacetime business. New ideas, more often than not, are born from a need, and such it was in this case.

In 1942, Edward I. Schumm of Chicago sensed a need for commercial facilities from which hard-pressed foundries might obtain part or all of their core requirements. For eight years prior he had been general manager of a brass foundry in Chicago, and had first-hand knowledge of bottlenecks and interruptions which occur in castings production when supply of cores falls short of molding operations. Corerooms usually are an integral part of a foundry, but, through shortage of coremakers or fluctuations in core demand, are not able always to balance output with consumption.

First Plant Outgrown in Three Months

Convinced that his idea was sound, Mr. Schumm formed the Coremakers Co. and in August, 1942, set out on the venture to make sand cores for the foundry industry. For its first quarters, he leased a small dormant brass foundry, shut down because of its inability to get brass. Here was available about 1000 sq ft of space and equipment to operate experimentally. Business began to come in and after three months this shop had become outgrown.

The company then leased and equipped 6200 sq ft at 1811 West Carroll avenue, Chicago, and has since conducted its operations there. Demand for cores now has expanded to the point where four times this space is needed, and another move is in prospect.

Currently, the company has about 40 employees; maximum during the war was 50. About 200 tons of sand a month is consumed in production of cores which are shipped to foundries as far away as 200 miles. In the war period, approximately 90 per cent of the cores were for nonferrous work; now the output is about equally divided between ferrous and nonferrous.

The plant has no railroad siding, which requires that the sand be trucked to the premises and unloaded manually for storage in suitable bins.

Principal equipment in the plant consists of a sand mixer; 15 core benches; five vibrating coredrawing machines; three rollover machines; a core blower; 1500 various size core plates; an automatic wire cutter; and a coke-fired manually-operated oven.

Unable to obtain prompt delivery of a core oven when the plant was occupied, the company designed and built its own. It has eight doors, four each on two levels, and work passes transversely through the oven, being loaded from one side and unloaded from the other. In the hands of an experienced tender, this oven has met all requirements.

The shop is laid out on a straight-line or progressive production system. The mixer is located adjacent to the sand storage bins and from here the sand is delivered to the coremakers' benches. Core wires and core dryers also are delivered to the benches. Close watch is kept to see that the benches are continuously supplied with all necessary materials. With workers provided to cut and mix sand, to bend wires, to keep supplies at the benches replenished, and to transfer cores to the oven for baking, coremakers are able to maintain their operations without interruption. In this way, maximum efficiency is attained.

The wire cutting and straightening machine is set apart in a corner of the shop and is run as required to keep wire supply well ahead of coremakers' (*Please turn to page* 198)

Modernization of Foundries

THE term "modernization" with respect to our foundries has been used very loosely. Many foundrymen think of modernization as mechanization. Actually, they are not synonymous, although it usually takes some degree of mechanization to accomplish a modernization program.

Foundry modernization includes modern thinking by owners, managers and operators, as well as modern physical facilities. It includes modern sales engineering methods of marketing castings, as well as modern methods of producing them. Those foundries who market a casting to do a particular job or perform a function, are enjoying better business and profits than those attempting to sell metal at so much a pound.

To operate a foundry in a modern and efficient manner, it is of primary importance that the producers be allowed to produce full time under the best possible conditions. This usually results in maximum unit production, i.e., production per man-hour, for a given set of conditions, and therefore the lowest costs for those conditions. Modern competition demands highest quality and lowest unit costs.

In order to examine the steps necessary to accomplish the modernization of a foundry, let us list them first and discuss them separately, as follows:

1. Organization
2. Procedures and methods
3. Costs
4. Facilities

You will note that facilities have been placed last; this is because the equipment or facilities are no better than the men and procedures back of them. Equipment will not think for you, and it is men who secure the results of which the facilities are capable.

Organization: It is essential, as well as desirable, that the foundry be properly organized with clear-cut lines of responsibility, and authority commensurate with that responsibility. One-man organizations in this day and age are seldom very successful. There must be one man who, in the final analysis, says "yes" and "no" on matters of policy and practice, but once the policy is established, the person responsible for the results should be permitted and expected to carry it out. The organization should be simple, with no overlapping or division of responsibility or authority.

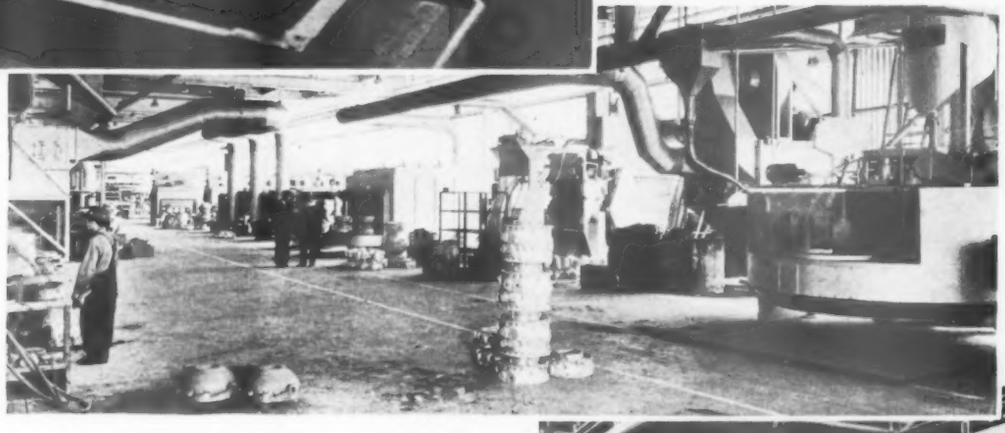
It is desirable, and today even necessary, to provide the foundry superintendent or manager with a specialized staff of assistants for advice and help on metallurgical and engineering problems. It is never conducive to best results to have the superintendent sit at his desk, with his hat on frontwards, and analyze a problem from one angle; then

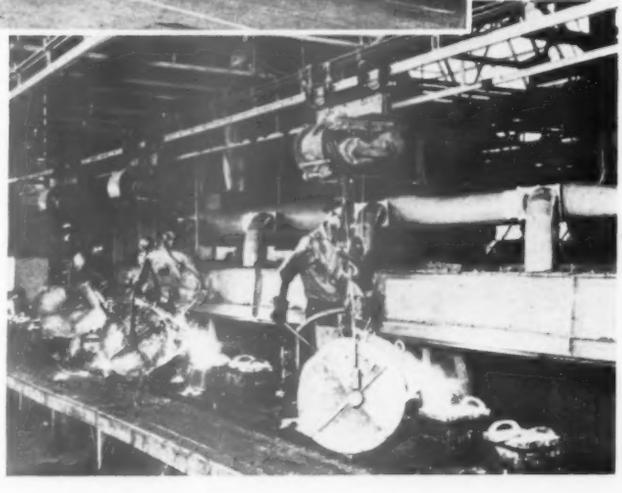
By LESTER B. KNIGHT
President
Lester B. Knight & Associates
Chicago

(Left)—Tower core oven. Note bright, pleasant working conditions. This type of equipment also lends itself to use of mezzanine floor for coremaking and main floor for finishing, storage and delivery. (Installation at Hamilton Foundry & Machine Co., Hamilton, O.; photo courtesy Foundry Equipment Co., Cleveland)

(Center below) — Cleaning room can and should be a pleasant place to work. It must also be an efficient operation. (Photo courtesy American Air Filter Co. Inc., Louisville)

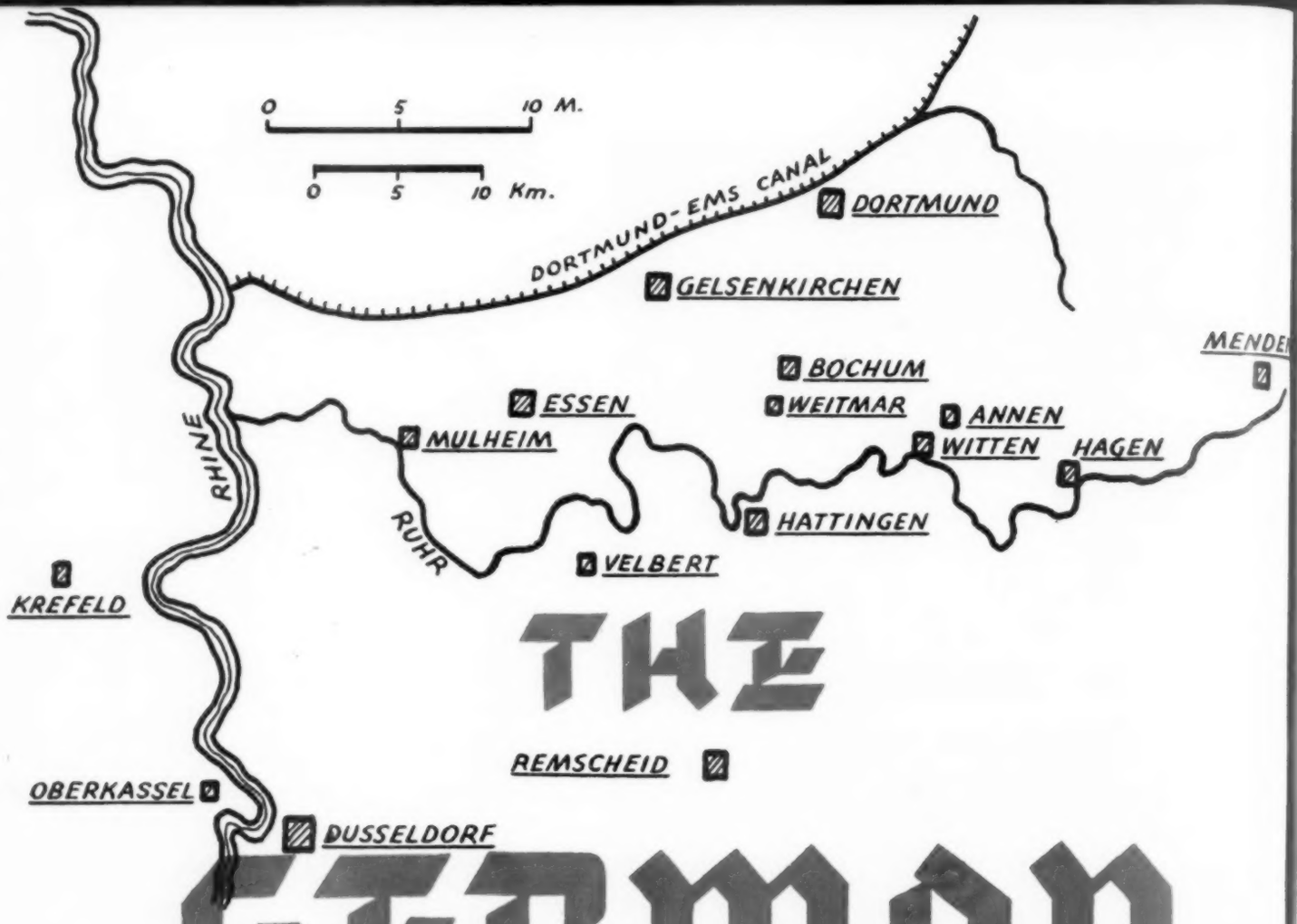
(Bottom)—Pouring becomes an easier job when done in an area where ventilation removes heat and smoke and the ladle is handled in a pouring device. (Installation at Belle City Malleable Iron Co., Racine, Wis.; photo courtesy National Engineering Co., Chicago)





turn the hat sideways and attempt to make a decision from an entirely different angle. He should be able to devote his time to the broad aspects and problems of producing high quality castings at low cost and not be confined by the technical details. He should, however, have control of these details through his staff or line assistants.

Many foundries today have established a committee that reviews all patterns and/or castings that are to be produced, and recommends in detail the method of producing those castings. Gating, risering, pattern design, amount of coring, size of flask, method of molding — all are analyzed and the best method selected. The make-up of this committee usually includes the superintendent as ex-officio chairman, the metallur- (*Please turn to page* 220)



THE GERMAN Steel Casting INDUSTRY

This comprises a summary of the author's observations as a member of the government's Technical Industrial Intelligence Committee during a six-weeks' investigation of various leading steel foundries in Germany

By CHARLES W. BRIGGS
Technical and Research Director
Steel Founders' Society of America

STEEL castings weighing a few ounces, to those weighing 230 tons, were produced during the war by the German steel casting industry. Most castings were for armament or parts of equipment to be used by the armed forces. Major classifications were: armor castings, tanks, tractors and automotive castings, aircraft, submarine and ship castings, projectiles, guns and gun carriages and parts. Castings produced to assist the prosecution of the war were: synthetic gasoline cracking plant castings, locomotive and railroad castings, mining equipment, castings for heavy machinery such as presses, and power plant equipment castings.

A portion of the castings produced would not be made as steel castings in peacetime, as they were more economically suited as forgings or weldments, but they were produced as castings because of the limitation of process capacity. Thousands of such castings weighing from a few ounces to a few pounds were produced in gray iron foundries converted to the production of steel castings. These castings averaged 85 to 90 per cent yield, as no risers were used.

Fig. 5 is a production chart taken from the records of the Vereindeutscher Stahlformgiesserein, the trade association of the German steel casting industry, and shows the production of liquid steel for castings for 1943 and 1944 by the 198 steel foundries of greater Germany.

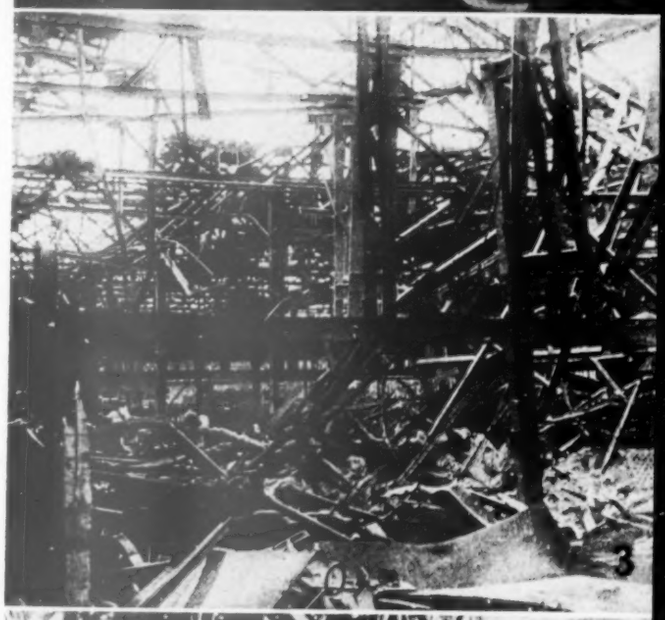
Peak Production Reached in 1944

During the war years steelmaking in steel foundries was equally divided among the open-hearth and electric furnaces and the side-blow converter. German steel production for castings in terms of the best month of prewar output is shown in Fig. 7, and it will be noted that peak production was not reached until as late as April, 1944. This is interesting in view of the fact that the peak was reached as a recovery from the spring and summer bombings of 1943, at which time production had dropped off 30 per cent. Effect of the heavy bombings in the fall of 1944 should likewise be noted.

The processes are separated in Fig. 6 to permit observation of the position of production by process as compared with prewar use. By the end of 1944, open-hearth production of castings was down to approximately 10 per cent, whereas in March, 1944, the converter produced about 300 per cent of its prewar tonnage. Electric and converter steel production was affected by bombing to such a degree that in a period of 3 months' time, the December, 1944, production was only half that of October.

Reduction in liquid steel production for castings to the low figures of 63 per cent of normal was not altogether the result of direct bombing of the plants. Many plants were forced to retard or stop production because of the bombing of rail and water communications, thus preventing the shipment of supplies and finished castings.

The records indicated that in normal peacetime about 120 steel foundries were engaged in producing steel castings, either as captive foundries or as plants producing



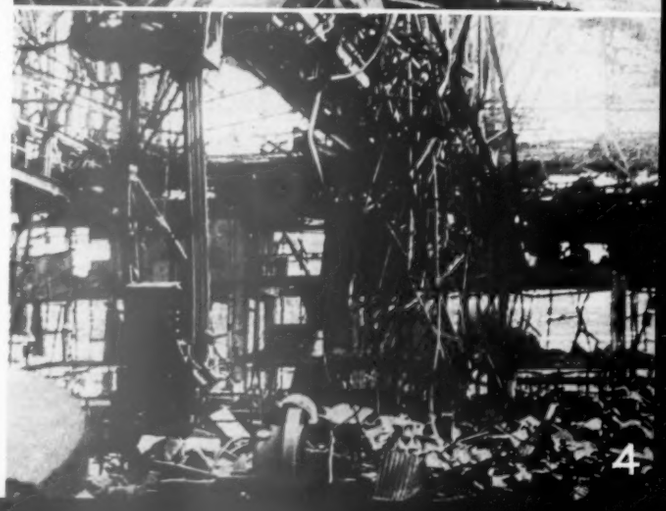


Fig. 1—Bombed steel foundry located in the Ruhr area

Fig. 2—Top-gating technique. Considerable use was made of this type of gating in German steel foundries

Fig. 3—Remains of steel foundry in the Saar Basin

Fig. 4—This bombed steel foundry is in central Germany

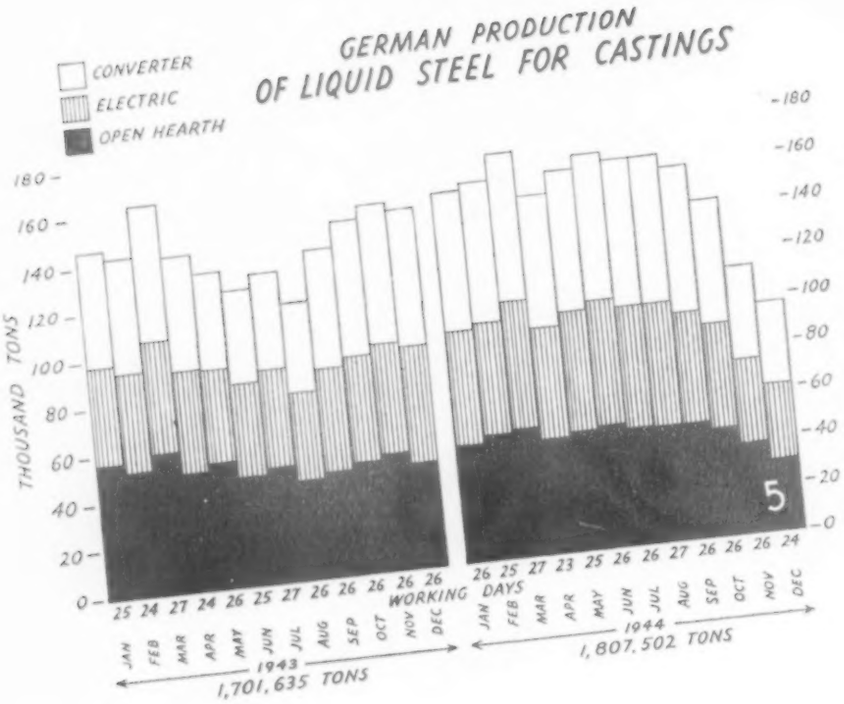
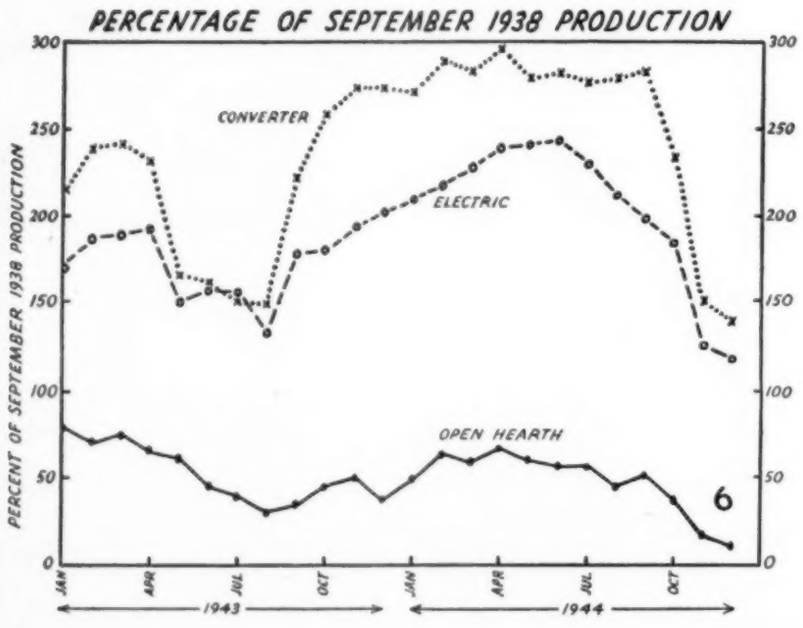


Fig. 5—German production of liquid steel for castings in 1943-44

Fig. 6—Breakdown of production by processes



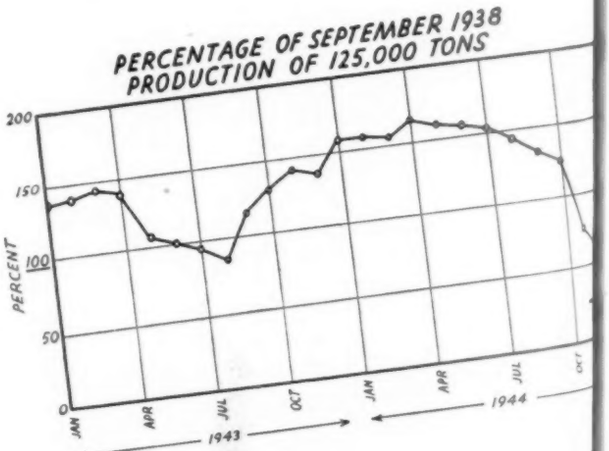


Fig. 7—Production of liquid steel in relation to September, 1938, tonnage

German Production of Liquid Steel for Castings—1944

Month.	Production in Tons				Working Days.	Increase Over September, 1938 in Per Cent			
	Open Hearth.	Electric.	Converter.	Total.		Open Hearth.	Electric.	Converter.	Total
January	48633	49224	59546	157403	26	48.8	211.9	272.9	157.9
February	51462	48367	59889	159718	25	63.8	218.8	290.2	157.8
March	53663	53719	63577	170959	27	58.1	227.6	283.5	155.5
April	48085	47678	56087	151850	23	66.3	241.5	297.1	166.4
May	50413	51953	58532	160898	25	60.4	242.3	281.3	159.7
June	50931	54417	61202	166550	26	55.8	244.8	283.4	158.5
July	51275	52426	60188	163889	26	56.9	232.1	277.0	154.3
August	49457	51425	62878	163760	27	45.7	213.6	279.3	144.7
September	49412	47233	61038	157683	28	51.1	199.3	282.2	132.7
October	45554	45026	53177	143757	26	39.4	185.3	233.2	127.1
November	38017	35789	40002	113808	26	16.3	126.7	150.6	76.7
December	30280	31900	35047	97227	24	10.0	118.9	137.8	63.5
				1,807,502					

Source: Verein deutscher Stahlformgiessereien

castings for sale. The additional 78 foundries engaged in making steel castings were mostly gray iron foundries that made steel castings for the war effort at the request of the German government. Practically all of these foundries produced their steel by the acid side-blow converter practice. Thus, in April, 1944, at the peak of casting production, converter steel was 37 per cent of total production, while electric furnace steel was 31 per cent and open-hearth 32 per cent of the total. Many foundries producing electric furnace steel or open-hearth steel, or both, also made converter steel for castings.

The steel foundries investigated produced about 30 per cent of the entire steel casting production of greater Germany. Areas investigated were controlled by the British, American and French armies. All of the foundries producing aircraft castings were visited and foundries producing approximately 70 per cent of all low-alloy steel castings were also studied.

Basic Process Used Almost Universally

The basic practice is the most universally used method of steelmaking, almost all of the open-hearth and electric steel production for castings being by that practice. On the other hand, nearly all the converter steel for casting is made in acid-lined converters.

Basic Open Hearth—The average size of open-hearth furnaces was from 30 to 35 tons capacity. A few, such as those at the Weitmar Plant, Bochumer Verein, were 60 tons capacity. A number of the German engineers maintained that the best quality of basic open-hearth steel could be produced for castings in furnaces of about 30 to 35 tons capacity.

Most furnaces contained rammed bottoms of a mixture of dolomite and 6 to 12 per cent tar. This type was favored because it was claimed that steel of lower sulphur content could be obtained than if magnesite bottoms were used.

There was very little instrument control equipment at the furnaces. Considerable reliance was placed on the knowledge and experience of the melters and melting superintendents. These men, for the most part, had been with their organizations many years and a great percentage of them had doctor's degrees. Slag control consisted of slag pancake tests with observation of the fracture color. It was a general rule that the last slag sample should not contain more than 10 per cent FeO. Chemical determination of FeO required approximately 10 minutes in a number of plants.

The furnaces generally were fired by coke oven gas and generator gas. At meltdown the carbon usually averaged from 0.85 to 1.00 per cent. Carbon drop averaged between 0.15 and 0.30 per cent per hour.

When the phosphorus content at meltdown was high, which condition was the normal state of events, the slag was run off in the tilting open hearths and tapped through a slag hole in the stationary furnaces. In the latter case the slag was removed from the ladle, and the molten metal coming over with the slag was recharged to the furnace. In many cases three slags were used to produce steel of the proper phosphorus content. The phosphorus and sulphur content of the finished steel averaged 0.02 per cent each.

Acid Open Hearth—Only three steel foundries—Krupp, Deutsche Eisenwerke, Ruhrstahl Gelsenkirchener—produced acid open-hearth steel for castings. The capacity of these furnaces was from 20 to 30 tons. The process was not liked for steel castings by German foundrymen, as they were unable to obtain low sulphur contents. It was held that sulphur content should be kept to an average of 0.02 per cent or lower to keep hot tears at a minimum and to maintain high ductility on the addition of aluminum.

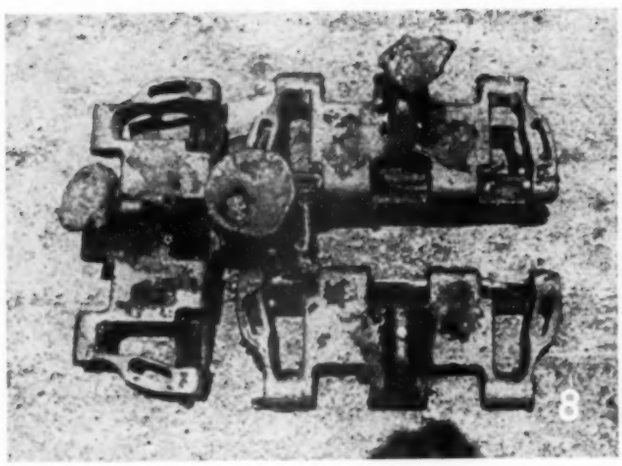
The charge would normally consist of 25 to 30 per cent low-phosphorus and low-sulphur pig iron, with the remainder basic open-hearth scrap. Carbon content at meltdown would fall from 0.60 to 0.80 per cent. Ore additions amounted to 0.7 to 1.2 per cent of the charge. A long oxidizing period was maintained as it was believed by the German steelmaker that only in this manner could high-grade acid steel be made. The phosphorus and sulphur content of the finished steel would average about 0.04 per cent each. The steel was used primarily for non-specification steel such as mine car wheels, pulleys, automotive castings and such castings of a round or symmetrical shape where hot-tear formation would be at a minimum.

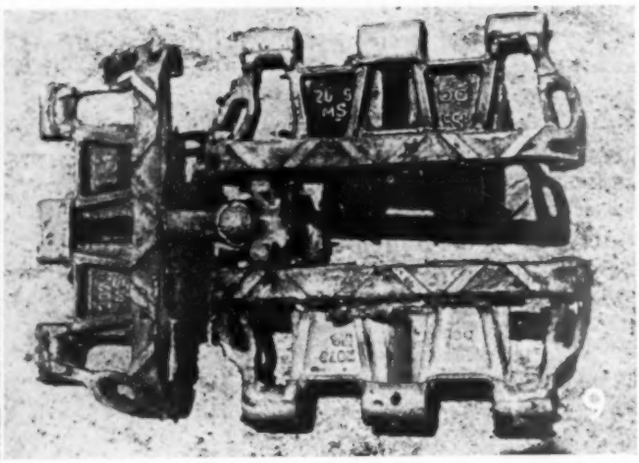
Basic Electric—Capacity of the basic electric furnaces in the steel foundries averaged from 2 to 40 tons. The

German Production of Liquid Steel for Castings—1943

Month.	Production in Tons				Working Days.	Increase Over September, 1938, in Per Cent			
	Open Hearth.	Electric.	Converter.	Total.		Open Hearth.	Electric.	Converter.	Total
January	56506	41168	48355	146029	25	79.8	171.3	215.0	135.7
February	52161	42045	49436	143642	24	72.9	188.6	238.5	141.5
March	59362	47477	56720	163559	27	74.9	189.6	242.2	144.5
April	49996	32876	49223	142095	24	65.7	194.4	234.0	138.9
May	52889	39412	42115	134416	26	61.8	149.7	163.6	108.1
June	45802	38981	39867	124650	25	45.7	156.8	159.8	101.2
July	48152	41730	41407	131289	27	41.9	154.5	149.8	96.2
August	42504	36717	39561	118782	26	30.0	132.6	147.9	84.4
September	43856	44065	51402	139323	26	35.0	179.2	221.9	116.2
October	47444	44484	57222	149150	26	45.2	181.9	258.5	131.5
November	49365	46769	59714	155848	26	51.1	196.4	273.9	141.9
December	45245	47867	59740	152852	26	38.4	203.3	274.2	137.2
				1,701,635					

Source: Verein deutscher Stahlformgiessereien





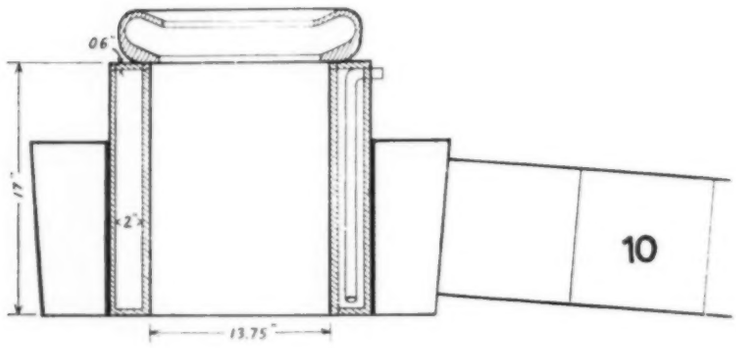


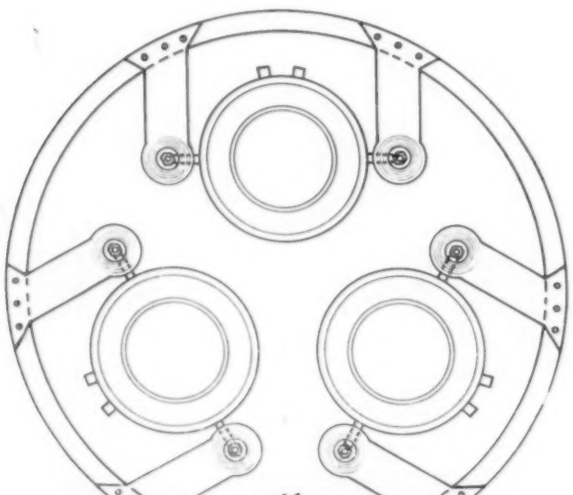
Fig. 8—Cope view of tank track castings

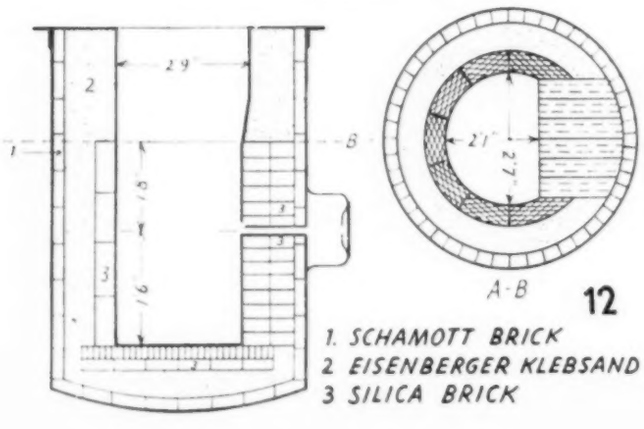
Fig. 9—Drag view of same track castings

Fig. 10—Cross section of the Krupp ring, a cast water jacket installed around each electrode and extending entirely through the electric furnace roof. Use of this ring is claimed to have extended roof life considerably.

Fig. 11—Method of holding the Krupp ring to the furnace

Fig. 12—Typical lining of acid converter





major types used were: (1) the stationary, (2) the stationary furnace with the roof rolled out over the pit (Stein-Roubair), (3) the stationary roof with the furnace rolled back over the charging floor (Brown-Boveri), and (4) the 30° rotation rolled-back furnace with stationary roof (DeMag).

All furnaces were lined with dolomite and 6 to 10 per cent tar. Bottoms were rammed 16 to 20 in. thick for 8 to 40-ton furnaces. Side walls were rammed to a thickness of 10 to 12 in. Roofs consisted of silica brick normally laid in rows instead of in the concentric fashion normal in the United States. Average refractory life was: hearth 600 to 1000 heats, side walls 80 to 100 heats, roof 60 to 100 heats. The Soderberg type of electrodes were largely used. A 6 to 8-ton furnace required 16-in. diameter electrodes.

Carbon content at meltdown averaged 0.50 to 1.00 per cent. All furnace operators required at least a 0.30 per cent carbon drop during the boil. During the oxidation period from two to five slags were taken off to assist in phosphorus removal. During the refining period an operation of from 1 to 1½ hours, under a white disintegrating slag, was required. All ferroalloys were heated prior to adding to the furnace, so as to be free from moisture and possible hydrogen pickup. Ferrosilicon was heated to 1000 to 1300 F to remove hydrogen. Slag-making materials were kept in dry places to keep moisture absorption at a minimum.

In a number of foundries a rule was maintained of not permitting the finishing slag to contain more than 1 per cent total of iron, manganese and chromium; otherwise, no slag analyses or viscosity tests were made. Metal

fluidity tests were conducted only in connection with thin-walled aircraft castings. Phosphorus and sulphur contents generally were under 0.02 per cent each. In some cases, for less critical castings, the permissible phosphorus and sulphur was upward of 0.035 per cent.

A number of steel foundries in Germany were engaged in producing light-walled aircraft steel castings. These castings finished to sections of ¼ to ½-in. The steel was made in the basic electric furnace, and because of the light sections it was necessary that the steel be tapped very hot (from 3100 to 3300 F).

A Ruff fluidity test was employed at the furnace for aircraft castings, using a 5-mm diameter channel. A minimum fluidity of 320 mm (12½ in.) for the aircraft castings was run. Since extremely hot steel was required for the thin-walled aircraft castings, the acid roof life on the basic furnace was rather low until the Krupp ring was used. This ring is a cast water jacket that is installed around each electrode, and extends entirely through the roof. The exposed metal face was from 1 to 2 in. wide, and cold water was projected along the exposed section.

Device Increases Life of Roof

Fig. 10 shows a cross section through the ring, in place in the roof, and Fig. 11 shows the method of holding the rings so that they are not a part of the weight applied to the brick roof.

With use of the Krupp ring, the life of the roof was increased from 25 heats to 150 heats per lining at Rochling Stahlwerke Volkingen, near Saarbrucken. The management was very enthusiastic concerning the value of the Krupp ring.

Acid Electric—Only two steel foundries in Germany used the acid electric practice—Deutsche Edelstahlwerke, Remscheid, and Eisengiesserei Streicher. Only carbon steels were produced by this method. The castings were small and poured by hand shanks, hence a good degree of metal fluidity was required. The castings were not made to specifications, and usually were automotive castings.

Ore was added with the charge and again at meltdown. Carbon content at meltdown was from 0.30 to 0.40 per cent, whereas after the boil it was 0.15 to 0.20 per cent. The FeO content of the oxidizing slag was 25 to 40 per cent. Spiegel was used to slow the boil, and a partial slag-off was made at the end of the boil to lower the FeO content. Sand and limestone were used for the refining slag. The melter aimed to produce a high green finishing slag. All heats were tapped at 3100 F or higher. Aluminum in quantities of 1.5 to 2 lb per ton was added to ladles and hand shanks.

Acid Converter—Most converter furnaces in the steel foundries were approximately 2 tons capacity, and they were lined as shown in Fig. 12. Lining life was from 80 to 100 heats.

Cupola iron of 2.3 to 2.8 per cent C, and 1.3 to 1.6 per cent Si, 0.10 to 0.12 per cent S and 0.07 to 0.08 per cent P were used. The alkali treatment of the cupola metal for removal of sulphur was not carried on too efficiently, as a record of sulphur reduction below 0.08 per cent was seldom encountered.

Operation of the acid converter in Germany was similar to that in this country. The ferromanganese was usually preheated to temperatures above 1200 F before adding it to the converter. A 20 to 25 per cent greater recovery of manganese was possible because of the preheating requirements. The ferrosilicon was also heated above 1200 F before adding to the ladle. As much as 4 lb of aluminum per ton was added to the ladle. The finished steel contained a 0.085 to 0.12 per cent P and from 0.08 to 0.12 per cent S.

Induction Furnaces—The German steel casting industry employed a large number of induction furnaces. For the most part these were lined with quartzite (ganister) and 10 per cent borax. Approximately 100 to 140 heats per lining could be obtained for low-alloy steels. Broken glass, approximately 2 per cent weight of the charge, was often used as a slag covering.

Aircraft Castings—Some 50-odd steel casting classifications were produced for German aircraft; a few of these were cylinder barrels, casings, bearing blocks, brackets and covers, fork pieces, struts, wheel segments, axle shanks, fittings, lever parts, propeller hubs, etc. At one foundry alone, Ruhrstahl Annener Gusstahlwerke, about 1300 tons per month of liquid steel were produced for aircraft castings.

The aircraft casting design was prepared as a joint undertaking of the aircraft manufacturer and the steel casting producer. Trial castings were prepared by the foundry and inspected at the foundry by an agency of the Aircraft Ministry. All foundries producing aircraft castings had to be approved by the Aircraft Ministry. If the trial castings were satisfactory, the foundry was approved for the particular casting design under test, and for quantity production the foundry was required to set up procedures based upon the quality control established for the trial castings.

A number of important parts, when produced as castings, were given service tests. Records indicated that a design could be made, trial castings produced and approved by the Aircraft Ministry for production in 3 weeks to 3 months. Castings that required service tests took a longer period of time; but approval was usually forthcoming in the 6-month period following the beginning of the casting design. Designers used identical design factors for steel castings and for forgings. All forgings were redesigned if they were to be (*Please turn to page 137*)

CAST STEEL DIN 1681

MINIMUM VALUES

NO.	TENSILE STR. p.s.i.	YIELD POINT p.s.i	ELONG. %	R.A. %	IMPACT mkg/cm²
NORMAL GRADE					
38.81	54,000	—	20	—	—
45.81	64,000	—	16	—	—
52.81	74,000	—	12	—	—
60.81	85,000	—	8	—	—
SPECIAL GRADE					
38.81 S	54,000	25,600	25	—	—
38.81 K	"	"	"	—	7
38.81 B	"	"	"	25	—
38.81 BK	"	"	"	"	7
45.81 S	64,000	31,000	22	—	—
45.81 K	"	"	"	—	6
45.81 B	"	"	"	20	—
45.81 BK	"	"	"	"	6
52.81 S	74,000	35,500	18	—	—
52.81 K	"	"	"	—	4
52.81 B	"	"	"	17	—
52.81 BK	"	"	"	"	4
60.81 S	85,000	51,000	15	—	—

Fig. 13—Government cast steel specifications

Golden Jubilee Show

TO BE LARGEST IN A•F•A HISTORY

THE LARGEST exposition of foundry equipment and supplies in history is assured for the Foundry Show to be held in connection with the 50th Anniversary Convention of the American Foundrymen's Association at Cleveland, May 6 to 10. Original plans called for the use of four exhibit halls of Cleveland Public Auditorium, but the demand for space has made it necessary to make use also of the main floor arena. This will give a total exhibit floor area of 116,000 sq ft, the most ever devoted to the Foundry Show, while the number of exhibitors also will exceed the highest of any previous year.

With the opening up of the arena to exhibits, the restaurant and lounge previously planned for that space will be relocated to the south hall, immediately south of the auditorium exhibit hall. All available meeting rooms of the auditorium will be taken over for technical and business sessions.

Northeastern Ohio Chapter of the AFA, host at the Golden Anniversary Convention, has appointed a number of committees which have plans well under way for various arrangements connected with the affair. A. G. Denison, president of both Fulton Foundry & Machine Co. Inc., Cleveland, and the Northeastern Ohio Chapter, is serving as general chairman. Other members of the General Committee are: Vice chairman, Henry J. Trenkamp, Ohio Foundry Co.; secretary, Gilbert J. Nock, Nock Fire Brick Co., and treasurer, F. Ray Fleig, Smith Facing & Supply Co.

Northeastern Ohio Day Scheduled for May 7

Chairman of individual committee include: Welcoming Committee, George Leroux, National Malleable & Steel Castings Co.; Transportation Committee, George Walton, Madison Foundry Co.; Finance Committee, F. Ray Fleig, Smith Facing & Supply Co.; Publicity Committee, Sterling N. Farmer, Sand Products Corp.; Plant Visitation Committee, John Price, Ferro Machine & Foundry Co.; Banquet Committee, Thomas Johnston, Republic Steel Corp.; Northeastern Ohio Day Committee, Ed M. Follman, Griffin Wheel Co.; Ladies' Entertainment Committee, Russell F. Lincoln and Mrs. Gilbert Nock; Entertainment of Foreign Visitors Committee, J. H. Tressler, Hickman, Williams & Co.; Committee for Arrangements, Frank Cech, Cleveland Trade School. Northeastern Ohio Day at the Foundry Show is scheduled for Tuesday, May 7, from 1 to 10 p.m.

A large number of interesting papers are to be presented at the nearly 50 technical sessions arranged for the week, the program for which is practically complete. Scope of the subjects to be covered is indicated by titles of some of the papers that have been prepared. Gray iron sessions, for instance, will include among others the following: "Heat Treatment of Gray Iron," "Relation Between Section Size and Mechanical Properties," "An Attempt to Correlate Specific Gravity," "Relation Between Hardness and Tensile Strength of Gray Iron," "Fatigue Limit and Notch Effect of Gray Iron," and "Wear Resistance of Gray Iron."

The Aluminum and Magnesium Division sessions will include committee reports on shrinkage and porosity of aluminum and magnesium castings, on recommended practices for aluminum and magnesium (Please turn to page 130)

Materials and the Postwar World

By J. C. DeHAVEN
Battelle Memorial Institute
Columbus, O.

Development of new and improved products in many cases has been made possible largely because of research and betterments in materials and methods, the author points out. This article is from a paper presented at a Cleveland district meeting of the American Society for Testing Materials

MANY laymen are becoming a little bit suspicious of anyone who talks about the wonderful things that are to be his in the postwar world. During the latter part of the war the average citizen was confronted by magazine advertisements, read popular articles in the press, and was blasted by the radio—all with promises that as soon as the Zilch Co. finished winning the war, its entire facilities for turning out "Super-Stuff" (exact nature restricted by military necessity) would be devoted to making his life a bed of roses in a land of milk and honey. He had really expected that, within a week of VJ-Day, a helicopter salesman or two would have called on him to sign on the dotted line for spring delivery of a streamlined beauty to be used in commuting between the office roof and that open space in the back yard between the plum tree and the peony bed. But he had not been approached and he felt vaguely disappointed.

Mrs. Average Citizen was not able to find a single one of those light-weight divans that you could lift with one hand and sweep under with the other; and there was not a respectable line formed anywhere to buy nylons, let alone those wonderful stainless steel stockings that were to last a lifetime. When the pictures of the new cars were released, both felt really let down. They had thought at least the deluxe models would have plastic turret tops, and Mr. Average Citizen had predicted a rear-engined, gas turbine model from the Ultra-Six people—of course, he wouldn't buy one for the first year or so, until all of the bugs were worked out.

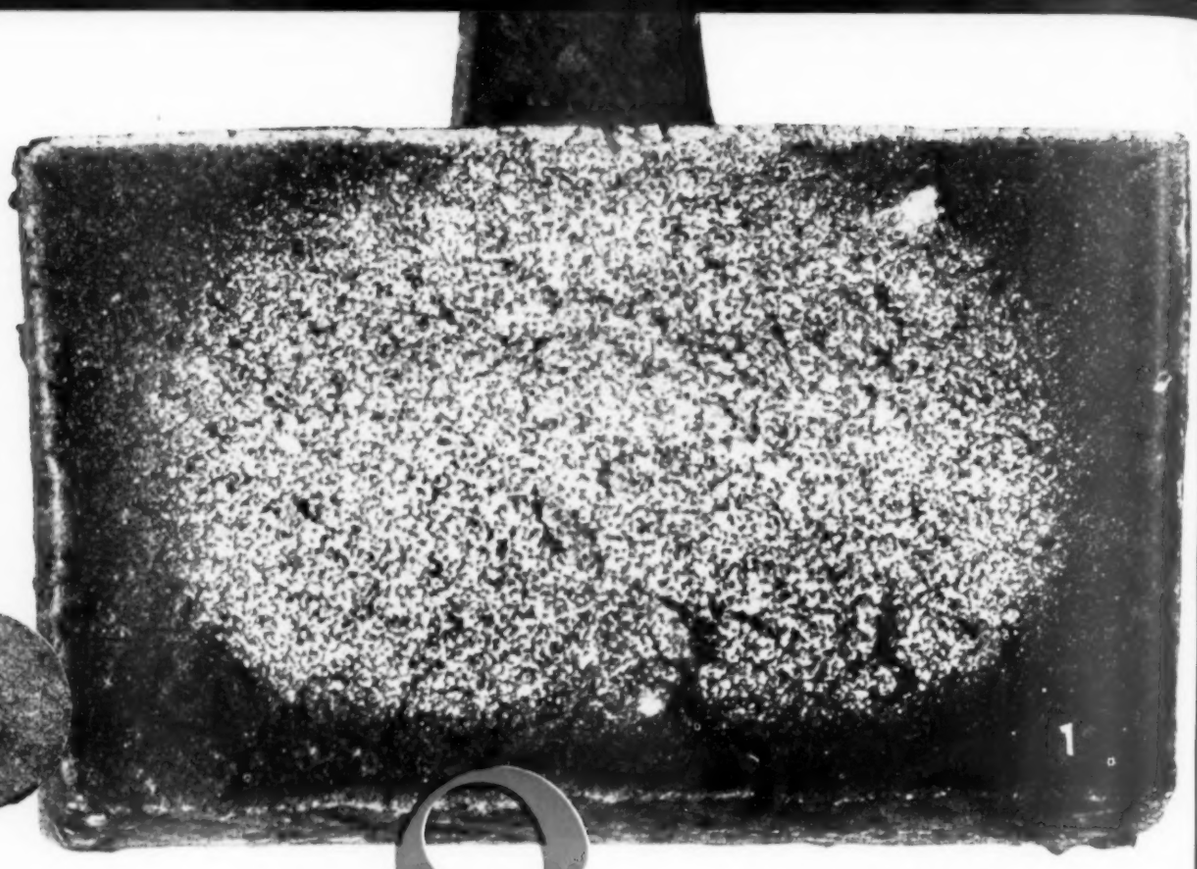
Engineers and materials men often are in no better position to evaluate the true status of the wartime developments than are individuals without technical training and experience. The general tendency of the technical man is to minimize the extent of the changes rather than to overemphasize them. This is probably caused by his being so close to the details of his particular field of interest that he has not grasped the real overall progress that has been made, and in being so involved, by necessity, with his own field, that he has not become familiar with developments in other technologies. Then too, such spectacular developments as radar, the gas turbine, and the atomic bomb have caused many improvements in materials to be paled by comparison. We certainly must remember, however, that these devices have been made possible entirely as much by research and improvements in materials and methods as by research in electronics, turbine design and nuclear physics.

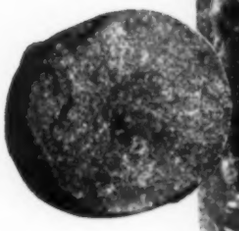
To illustrate this point, the principles of the gas turbine have been known for years. Experimental turbines had been built which, although they would run, were very inefficient, generating just about enough energy to turn their own rotors without much left over for doing useful work. It is true that the improved design of the compresser was an important factor in making the gas turbine practical, but turbines would be very short lived and inefficient were it not for the development of special temperature-resistant alloys for turbine buckets and nozzles.

This alloy development program had a head start before the war because temperature-resistant materials were required for turbo-superchargers which are like gas turbines in operation. However, turbo-superchargers operate at temperatures around 1200 F, while gas turbines must operate hotter and over a greater service life to become really efficient. By concentrated research, sponsored and carried out by the armed services, by the Office of Scientific Research and Development, and by private industry, alloys were developed which would meet these requirements, so practical gas turbines became possible for ship and aircraft propulsion.

As is the healthy attitude of most scientists, the turbine engineers are not satisfied with the present gas turbines, but are seeking to realize the even greater efficiency theoretically possible with higher compression ratios and higher operating temperatures. The metallurgists are co-operating by conducting fundamental studies of the characteristics of temperature-resistant materials with the view of producing a product that will meet the new demands. Each upward step in operating temperature becomes increasingly difficult for the metallurgist to meet. It is like having the ball on the opponent's 20-yard line—every additional yard towards the goal becomes tougher because of the more restricted field of action. However, some very encouraging advances are being made which may result in the gas turbine becoming one of the most efficient engines ever known. We may not have gas turbines in automobiles for some years, if ever, but certainly they will appear in increasing numbers transport aircraft, in ships, and in stationary power plants.

It is an often neglected fact that improvements in manufacturing control techniques (*Please turn to page* 200)





Some Notes

By LESTER CROME
Director of Research
Dayton Malleable Iron Co.
Dayton, O.

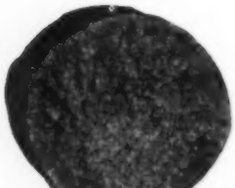


Fig. 1 — Enlarged view of chilled end of 1¼ x 2 x 12 in. bar cast with half its length on ⅝ x 2 x 6 in. chill

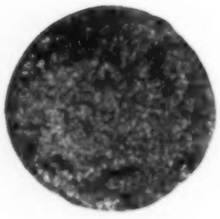


Fig. 2—End of bar shown in previous figure that was not chilled. Light area in center is shrink

Fig. 3 — Bar ⅞-in. diam., 7 in. long; gated at one end, chilled at opposite end. Center specimen is from middle of bar. End specimens are approximately 1¼ in. from the ends. Top specimen is gate end, bottom one is chilled end

MANY known factors influence graphitization, and doubtless many yet unknown do likewise. One very potent factor, scarcely appreciated if at all recognized, is the thermal journey from the fluid state to atmospheric temperature. True, in malleable and gray iron foundry practice, consideration is given to the section size in determining the proper composition of the charge, but this is concerned only with the cooling rate through the range of primary graphitization.

In malleable iron practice a very thin section will, in general, graphitize faster in the malleablizing operation than a heavy section. Taking two pieces of the same section, one cast in sand, the other in a chill, the chill cast piece will graphitize faster than the sand cast. This generally is attributed to the finer structure of the quickly cooled metal. This may be the proper explanation or it may be only a part of it.

If a piece of hard iron be removed from the mold and quenched in water before it has cooled to 1400 F it can be graphitized in a fraction of the time it would have required if it had been allowed to cool normally. Here the quenched piece does not have a finer structure—or at any rate it is not noticeable—and the eutectic particles are no smaller than if it had been slowly cooled. After malleablizing, the quenched piece will be found to

...on Graphitization

have its carbon distributed in extremely small nodules. Apparently the treatment has set up many nuclei for carbon precipitation.

In malleable iron practice, if the molten metal is treated with certain additions, it becomes very responsive to a pre-anneal heat treatment between 400 and 800 F. After this heat treatment there is no apparent change in the structure of the hard iron. While no change is apparent at this stage, something has taken place, for this material will now graphitize much faster than it would have without the pre-anneal treatment and the carbon will be deposited in nodules much smaller than normal, indicating that the treatment has set up more nuclei for carbon precipitation.

Cases have occurred in malleable practice where it has been difficult to secure complete graphitization of a test lug, yet if the casting was broken it was found to be normal. By moving the test lug to some other part of the casting or by changing the size of the lug the difficulty is overcome. What really happens in an occurrence of this sort is a change in the heat treatment of the lug as the casting cooled in the mold.

In working with a malleable iron treated to respond readily to the 400 to 800 F pre-anneal heat treatment it was found that if the metal was first heated to above 1400 F and cooled, the low temperature treatment was no longer effective. If the low temperature treatment was carried out first, other treatments did not interfere.

Working with the same material it was found that certain test lugs on certain sections would have a much coarser carbon nodule at the tip than at the juncture with the casting or the casting itself. This indicates a possible peculiarity in cooling in the mold which might have been a sudden cooling of the lug tip followed by a slight reheat from the casting proper at some critical temperature, possibly around 1400 F, thus interfering with subsequent nuclei formation.

With this thought in mind the effect of chills was studied, using an iron responsive to the low temperature pre-anneal heat treatment. First a bar 1¼ x 2 x 12 in. was cast with half its length on a chill ⅝ x 2 x 6 in. It was given 3 hr at 600 F, aircooled and then an overall malleablizing cycle of 15 hours (Figs. 1 and 2). The end not chilled had a normal black fracture. It was well graphitized, with the carbon in small nodules. The chilled end had a heavy black frame and a white center. The center was too hard to saw. The black portion of the frame was well graphitized, with the carbon in small nodules. As the center was approached the carbon nodules became larger and less numerous, with pearlite

and cementite appearing. In the center it was possible to pick a field with no appreciable carbon showing, only pearlite and cementite. By moving the specimen only about ⅜-in. a field could be found near the edge with no carbides at all.

Next, different sections were tried with different size chills producing the following summarized results:

Sections up to ½-in. thick did not appear to be adversely affected by any size chill.

A bar ¾ x 2 x 8 in. showed some adverse effect from a chill ½ x 1 x 6 in. but none from larger chills such as ¾ x 2 x 8 in.

A bar 1 x 2 x 8 in. (Fig. 5) responded the same as the ¾ x 2 x 8-in. bar.

A bar 2 x 2 x 10 in. was not affected by the small chill but showed a slight adverse effect from a chill ¾ x 2 x 8 in. and a pronounced adverse effect from a chill 1¼ x 2 x 12 in.

The bar 1¼ x 2 x 12 in. was adversely affected by every chill tried, ranging from ½ x 1 x 6 in. to complete chilling of bottom and both sides by three chills each 1¼ x 2 x 12 in.

The results mentioned might indicate that the smaller sections did not have sufficient heat to reheat the chilled part through its critical temperature. As the section increases smaller chills affect it adversely, while the larger chills do not, which indicates enough heat to reheat in the case of the smaller chills but not when the chill is larger.

When the section becomes very large, 2 x 2 x 10 in., we find the reverse; that is, the heaviest sections are affected more adversely by the larger chills, indicating enough heat present to prevent the smaller chills from cooling a portion of the casting rapidly enough. The 1¼ x 2 x 12-in. bar seemed to be the right section to be adversely affected by all the chills used.

The standard malleable iron test bar has a ⅝-in. diameter gage length with ¾-in. diameter grip ends and is fed through risers at both ends. If the hard iron is treated in the ladle with a small amount of some graphitizer such as graphite, ferrosilicon, etc., so as to increase the tendency to produce primary graphite and this treated iron is poured into the test bar mold, contrary to all expectations the first part to show primary graphite is not the heavier, more slowly cooling ends, but the lighter section, the ⅝-in. diameter gage length, which has every reason to cool faster than the end sections (Fig. 6).

In some instances this difference has been very great. Some samples have had the ⅝-in. diameter completely gray with only a few small mottles in the ¾-in. diameter. Other samples with less tendency to graphitize would have the midpoint of the gage length heavily mottled and be free of mottles in the ¾-in. diameter.

It was first thought this might be due to, or greatly aggravated by, tensile stresses set up by change in volume during and immediately after solidification. Numerous attempts were made to produce primary graphite by exaggerating these stresses but no positive results were achieved. Another thought was that the metal was inoculating itself at the point where the two streams of metal met. This was quickly eliminated by experiment. The same results, although to a much smaller degree, were produced by gating from one end.

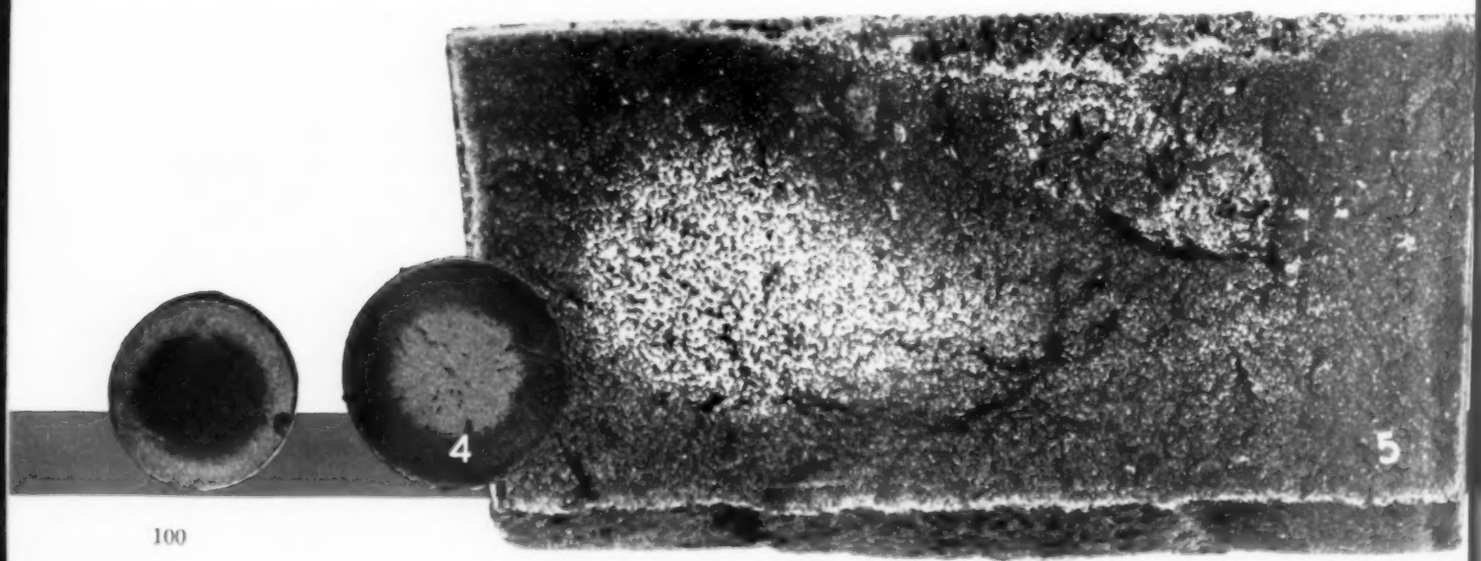
Bars Show Variation in Chill Test

Another test bar pattern was prepared, increasing the grip ends to 1-in. diameter with all other dimensions remaining the same as standard bar. Here too the same thing happened, the relatively small ⅝-in. diameter graphitized more than the 1-in. diameter ends. The end opposite the gate would graphitize more than the gate end. (Fig. 7).

A straight ⅝-in. diameter bar 7½ in. long was tried with the same general results although not so pronounced. When gated either one end or both ends it graphitized more about the midpoint than at either end.

Round bars, ⅞-in. diameter both 7 and 10 in. long, were gated at one end and a chill 2 in. in diameter and ½-in. thick was placed at the opposite end. The greatest amount of graphitization occurred some distance from the gate (Fig. 3). In the case of the bars 10 in. long the maximum graphitization would be from 3 to 5 in. from the gate end. Using this setup, the difference in graphitization was not so pronounced as in the case of the standard test bar gated both ends, but it was still very noticeable.

This particular experiment indicates an analogy to the familiar phenomenon occurring in gray iron when conditions are such that a corner or a thin projection of a gray iron casting is chilled white. Between this hard white



spot of practically all carbides and the normal pearlite-graphite structure of the casting will occur an area containing practically no carbides, an area of so-called "primary ferrite." In the case of gray iron this range of white iron through "primary ferrite" to normal pearlitic structure is considerably compressed linearly as compared with the range in the malleable base bars from all carbides through maximum graphitization to considerably less graphitization. However, they seem to have a lot in common, both probably being the result of the same mechanism. In gray iron more or less "primary ferrite" usually occurs at the surface and at corners that cool relatively fast but not fast enough to retain carbides.

Compare Three Heats from Induction Furnace

Another example points in the same direction. In the course of some other work three small heats were prepared in an induction furnace with 1.55 to 1.70 per cent C and 2.35 to 2.70 per cent Si. At that time we were interested only in the graphitization rate of this composition with respect to other compositions. The pattern used was the standard malleable test bar. As only small samples were required the bars were broken and half bars used. They had a clear white fracture as cast. After a short annealing treatment they were examined. Ordinarily microscope samples are taken from the ¾-in. diameter but in the case of one bar it happened that a hole had been drilled at this point for a chemical sample and the specimen was cut from the other end which was ⅝-in. diameter.

Examination showed the two ¾-in. diameter specimens to have the carbides broken down pretty well in a band about 3/16-in. wide at the surface but the core was almost solid pearlite. The third specimen, the one of ⅝-in. diameter, had its structure reversed, the center being free of pearlite but having a 3/32-in. band of pearlite at the surface (Fig. 4). Then samples of both diameters of all three bars were examined. They were consistent. The ¾-in. diameter of all three bars had cores of almost solid pearlite surrounded by a wide band of ferrite. The ⅝-in. diameter of all three bars had cores of ferrite surrounded by a band of pearlite. In each case the two sections were 3 in. apart. The writer believes the explanation lies in the cooling of the bars in the mold.

In summing up it is the writer's opinion that the cooling in the mold of all iron-carbon alloys, regardless of other constituents, from the molten state—and perhaps even from the maximum temperature attained down to atmospheric temperature, and perhaps to any possible minimum temperature—must be considered as a potent, elaborate and somewhat complicated heat treatment, having among other possibilities a powerful influence on graphitization. It is not simply a matter of cooling fast enough for a given malleable iron composition to prevent primary graphite or slow enough in a gray iron to prevent chilling.

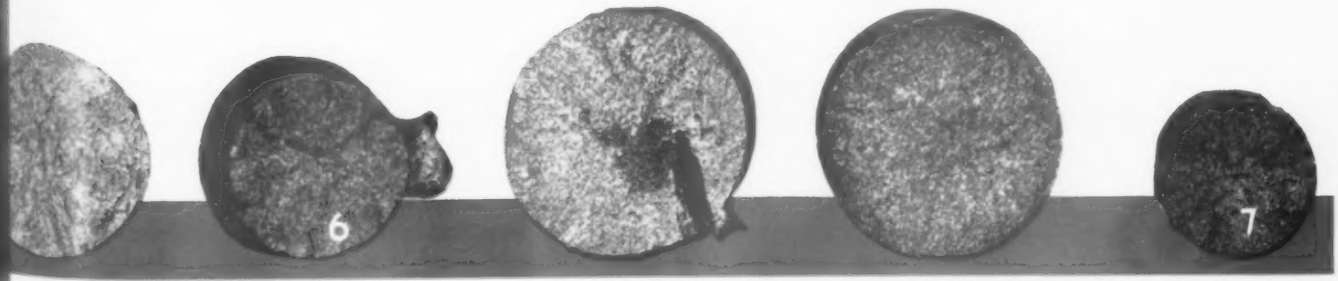
There is also the matter of extremely rapid cooling through certain temperatures or temperature ranges of parts of a casting, and this in some cases is greatly exaggerated by drastic reduction of the cooling rate, and even by a possible reheating of these parts by heat from the bulk of the casting, at some effective temperature. These conditions or combinations of conditions are some of the most potent of all factors influencing graphitization.

The experiments outlined in this paper indicate the following:

1. A white iron composition which has been drastically cooled from above 1400 F will graphitize in a fraction of the time required for slower cooling and the carbon will be distributed in much smaller nodules. This phenomenon is in no way associated with undercooling. It is something else entirely and is effective long after solidification has been complete. In fact, it may be accomplished on a slowly cooled casting by reheating and drastically cooling from anywhere above 1400 F.

2. The phenomenon just referred to or a similar one is also apparently effective in the whole range between 1400 F and solidification temperature. That is, if any iron is cooled drastically at solidification temperature or just under it, it is then so constituted that it will graphitize very readily, so fast in fact, for normal malleable compositions, that a slight reheat from a heavier part of the casting or a decided drop in the rate of cooling while still near this range will result in primary graphite in the case of an otherwise white iron. In gray iron these conditions will result in "primary ferrite." This might be termed undercooling. However, the writer does not feel that the term undercooling is quite adequate and believes that the process involves more (*Please turn to page* 232)

Fig. 4—Fractures of ¾ and ⅝-in. bars. Light areas are pearlite, dark areas ferrite. Fig. 5—Enlarged view of 1 x 2 x 8 in. bar which showed some adverse effect from small chill but none from larger chills. Fig. 6—Light specimen is ¾-in. diam., dark specimen ⅝-in. diam. Smaller section showed primary graphite sooner after pouring than did heavier section. Fig. 7—Three sections from ⅝-in. test bar having 1-in. diam. grip ends. Left piece is gate end 1-in. diam., next is end opposite gate 1-in. diam.; right is ⅝-in. diam.



Emphasis on production during the war frequently resulted in deviations from well-planned cost control systems. The author maintains that, in the interest of its future stability, it is time for the foundry industry's wage structure to return to a conservative and intelligent basis.

Cost Controls... NEED READJUSTMENT

PRIOR to V-J Day, industry felt that no contribution it could make toward victory too great a sacrifice. As a result, *cost controls in the foundry went to war.*

During the war, production became of primary importance and it cannot be said that the foundry industry shirked its responsibilities. It is not meant to convey that the industry was not rewarded with profits through this accelerated production; there was a profit, but this profit was earned through a determination to win the war, regardless of sacrifice or deviation from the sound principles of management.

Labor costs, to mention just one phase of costs in management, are without question the most important and hardest to control in foundries. During the war, the wage freeze served to control the situation to a certain extent, but even with its restraints the line could not be held. Typical of what happened to the wage structure of the industry as a whole, is possibly well illustrated by what has occurred in one of our most important foundry areas. In the various labor grades or occupations, from a low of 60c per hour and a high of $1.10 per hour at the time of the freeze, rates advanced to 80c for the low and $1.15 for the high, by the end of the war.

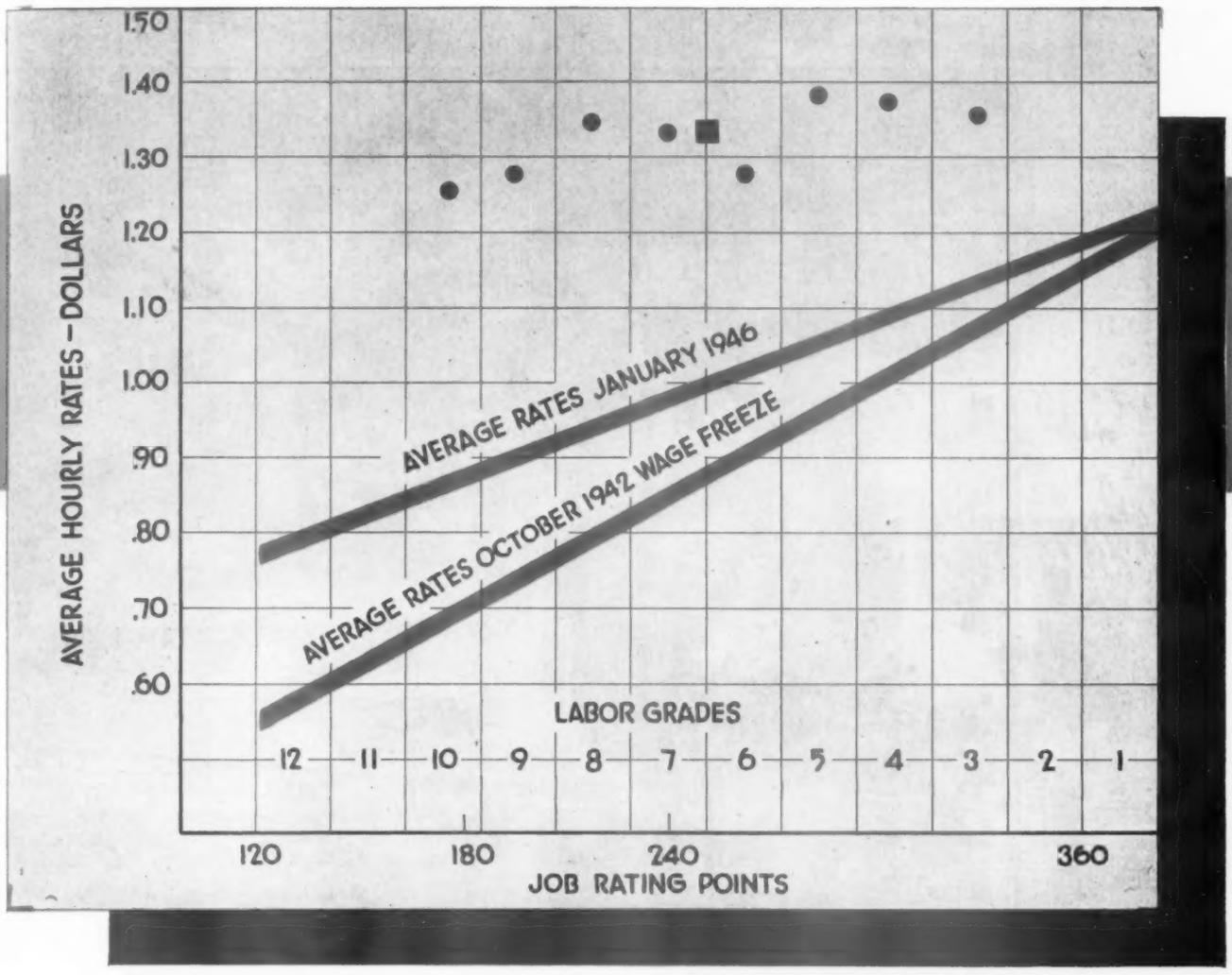
Without going into the influencing factors which brought this change about, it should suffice to state that our low wage bracket advanced about 30 per cent and the high bracket approximately 4½ per cent.

Differentials Between Various Skills Drops

The wage differential between the highly skilled worker and the workers in the lower or unskilled group has dropped from a differential of 185 per cent before the war to 145 per cent at the present time. Where either piecework or wage incentive systems were used, the margin between the high and low labor grades in many instances has been completely wiped out. In fact, in some cases the earnings in the low labor grades exceeded those in the high labor grades, which demand a much greater degree of skill. The accompanying chart serves to illustrate these changes and provides a picture of some of the problems confronting management in connection with labor cost controls.

Many foundries possessed good cost control systems prior to the war. As a part of their system, they also had a wage incentive plan. Unfortunately, during the war, in order to emphasize production to the extent which was necessary, the personnel needed to maintain these systems was transferred to supervisory positions in production which were adjudged more necessary. In many cases they were replaced, but with less qualified and fewer people than were originally required. Consequently, digression from a well-planned system resulted; short cuts were found and protective controls to management were dropped.

During the war, it was also found possible—temporarily at least—to solve wage problems through wage incentive plans. Due to a large percentage of the foundry's production being war work, new patterns made it possible to create loose standards



●—Average hourly earnings, without overtime, of all incentive workers within a Labor Grade

■—Average hourly earnings, without overtime, of all workers in the several Labor Grades.

Highest average earnings recorded for individuals in Labor Grade 5—$2.69 per hour, in Labor Grade 8—$2.68.

Chart represents approximately 2000 incentive workers. Practically all foundry workers fall in between Labor Grades 11 and 2.

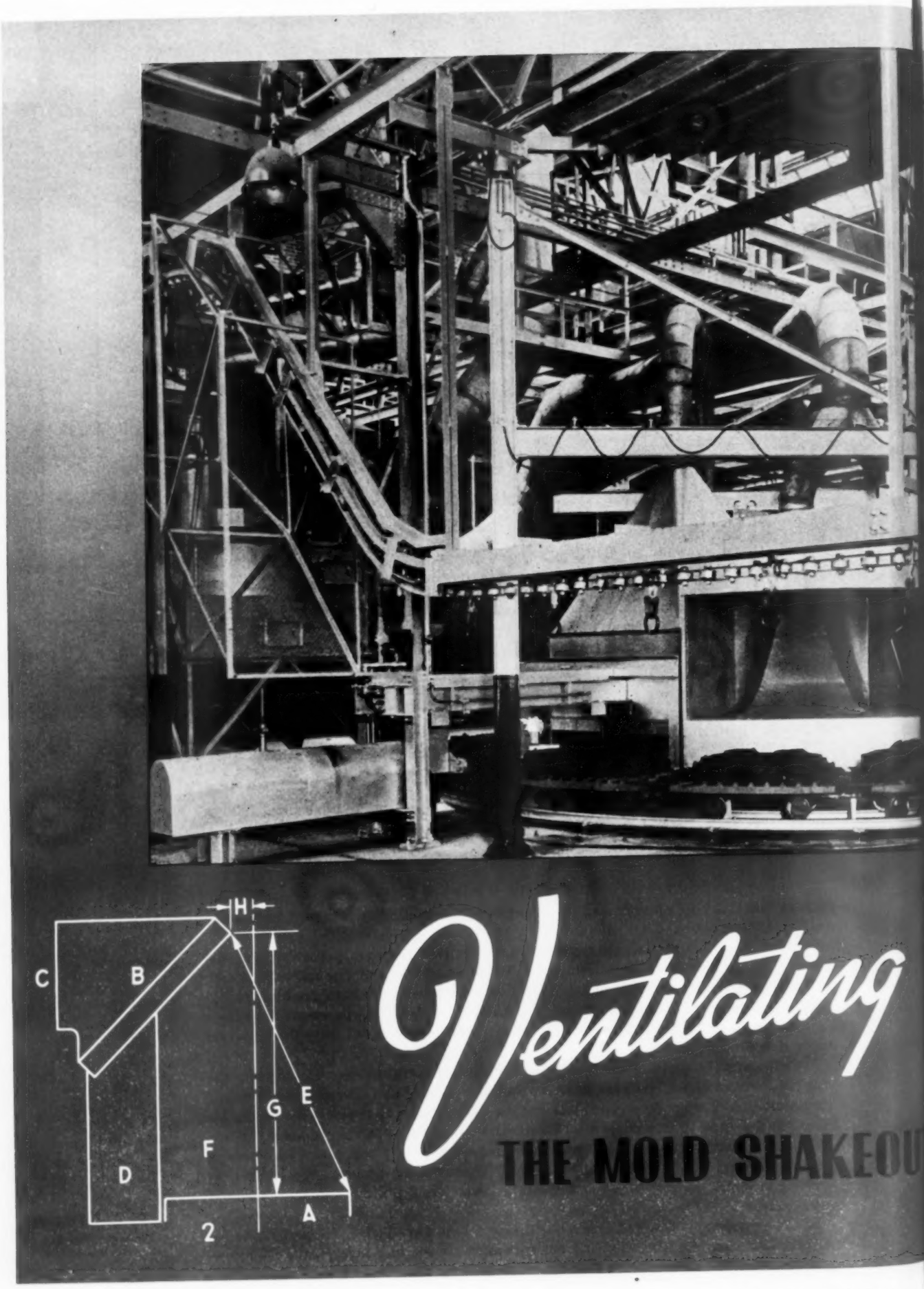
through the factoring or setting up of a specification; in effect, this served to increase wages.

Other contributory factors to increased incentive earnings, particularly in the lower labor grades, were improvements in plant conditions, mechanical equipment, methods, techniques and practices. These were intended as aids to production, but changes in piecework or wage incentive pay justified by these improvements have been neglected entirely, and resultant savings from such improvements have been passed on to the worker.

Conducive to speeding up production and relieving the manpower shortage, the War Production Board, through the Management Consultants Division, encouraged the installation of wage incentives. The effect this had was to create a mad-scramble overnight for wage incentive plans. Needless to say, there was not enough trained personnel to cope with this situation, and management received plans which were poorly conceived and of indeterminate value. However, in the majority of cases incentive plans did aid in production and worked wonders in relieving many immediate wage problems.

In the discussion of wage incentives we refer only to a plan which has as its primary purpose, *cost control*. The following description of a wage incentive plan is offered to management as an aid in securing a plan which will work (*Please turn to page* 232)

By C. E. WESTOVER
Westover Engineers
Milwaukee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Ventilating
THE MOLD SHAKEOU

THE mold shakeout is a source of considerable air contamination in the foundry. Whether it is a jobbing foundry where the molds are shaken out on the individual floors or a mass production foundry having a centralized shakeout, some method must be adopted to take care of the resulting large volume of dust, smoke and heat. Since the workmen must be positioned closely around the shakeout point to retrieve the flask and castings, and often to shovel the sand aside, they are working right in the dust cloud. Heat of the mold causes the dust and gas to rise quickly into the upper portion of the building, and without adequate means to remove the contaminated air it soon fills the entire room, subjecting all of the employees therein to the dust hazard.

Many foundries, including a relatively large number of the very small foundries, have installed complete mechanization to handle the sand, molds, castings, flasks and cores. A large number of plants, however, including some of the largest steel foundries, have not adequately handled this problem. Floor shakeout is still prominent and presents the most perplexing problem of dust removal. Some roof ventilation has been installed to throw out large volumes of dust through the roof, but this only transfers the dust problem from one point to another. The outside atmosphere becomes so contaminated that dust is drawn back into the buildings, inflicting high maintenance cost on machine shops and power plants and subjecting a far larger number of people to the dust nuisance.

The fully mechanized foundry provides the best possible basis for adequate dust control since it does concentrate the dust producing operations. Fig. 1 shows a plant where mold shakeout is fully housed with dust piping designed to remove the contaminated air to a dust separator or collector located outside of the building. Other ventilated points include pouring position to remove the gas produced, the point where the mold is separated, the various sand transfer points and the cleaning and storage of the sand. Compare this mechanized plant with one of the old type where the molds are set on the floor, poured on the floor and opened on the floor. Obviously, only a very small portion of the air in the mechanized plant needs to be cleaned as compared with the old style method. Other and more important savings and economies are derived from mechanization.

In some plants, similar to that shown in Fig. 1, it is necessary to install a mechanized shakeout for the drag and another for the cope to effect the desired economies. In this layout the mold is placed on a car or platen type (*Please turn to page* 210)

By C. C. HERMANN
Consulting Engineer
Grosse Pointe Park, Mich.

Fig. 1—Mold handling and shakeout in fully mechanized foundry. (Photo courtesy American Air Filter Co.)

Fig. 2 — Suitable hood design for 5 x 8 ft. shakeout. Shakeout at *A*, half canopy hood at *B*, duct connection at *C*, back shielding at *D*. Dimension *E* is 7 ft 8 in. Height *G* above shakeout is 5 ft. Front edge of hood *H* is 6 in. Hood length of 9 ft gives open area at front of 68.4 sq ft. Open area at each end *F* is 22.5 sq ft

Fig 3—Half canopy ventilating hood for mold shakeout. (Photo courtesy Claude B. Schneible Co.)

Probably of all the cast metals none defies complete mastery of its secrets more than gray iron, and no other industry is more in need of research, according to the author. This paper was presented before the annual convention of the Gray Iron Founders' Society

Gray Iron PROGRESS THROUGH Research

By HOWARD F. TAYLOR
Naval Research Laboratory
Washington

IT HAS been repeatedly proved in recent years that research is a fundamental necessity for all progressive industries. No one can question this statement in light of the fact that prewar manufacturers who did not maintain research staffs and develop new and improved utilities soon found themselves without a market for their products. Manufacturers of automobiles, washing machines, cooking equipment, radios and other well known utilities and luxuries were expected to develop novel characteristics in each new model marketed and to fail to do so was to invite bankruptcy.

Although the late war changed the emphasis of research effort from the luxuries of life into more sinister channels it intensified research a million fold. The Office of Scientific Research and Development was created to co-ordinate the research talent of America into one mighty effort to improve the implements of warfare. Army and Navy research agencies magnified their programs and their personnel a hundred fold and nations even pooled their research talents to win the greatest of all wars.

Naturally one cannot isolate the relative importance of research from all the other items that go to make a mighty war machine, but by now I am sure everyone appreciates the importance of radar research and of the greatest research gamble of all time, the $2 billion Manhattan Project. Jet propulsion, buzz bombs, rocket projectiles—to mention only a few of the more spectacular products of research—are mute evidence of the value of science in war. Science in postwar industry will be equally indispensable and a fundamental necessity for all basic industries.

Consumer Public Demands Improvements

The consumer public in America will demand unbelievable improvements in their utilities and luxuries and will be heartless in their insistence upon quality. In order to make possible this improvement in manufactured articles the individual components of the automobiles, washing machines and other items must be improved. This means castings of a quality presently unknown to most foundrymen. Optimum surface excellence, dimensional accuracy, internal soundness and greater strength and ductility will be demanded of iron castings. More accurate information on the properties of castings will be required by design engineers if they are to be expected to use gray iron castings in their products. Competition from steel and nonferrous castings will be acute, and the age-old battle against forgings and weldments will increase in intensity.

What this all means to a gray iron industry of prominence is *Research*—research on a big scale, well co-ordinated, properly directed and vigorously prosecuted, unless the industry is willing to relegate itself to building bigger and better bath tubs.

No industry is more basic than the gray iron foundry industry and none is more in need of research; none involves greater technical skill nor more practical know-how, and none offers more fascinating and perplexing problems to the willing researcher. Probably of all the metals cast in the foundry none defies complete mastery of its secrets more than gray iron.

It is not meant to imply that the gray iron industry is (*Please turn to page* 227)

Converter Process in Steel Foundries

Early developments in design of converter units are described by the author in this second of three installments discussing general practice in converter use

By JOHN HOWE HALL
Consulting Engineer
Swarthmore, Pa.

AN expedient resorted to by English steelmakers in the early days was to introduce the blast through the sides of the converter, instead of through the bottom. The Clapp-Griffith vessel, and a modification of it called the Hatton converter, embodied this construction and, in addition, were fixed instead of being mounted on trunnions. Naturally, they had to be charged, and tapped like an open-hearth furnace, while the blast was on. The side-blowing feature was also used in the Robert vessel, in which the tuyeres were placed on one side only and were arranged so that by tipping the converter partly over, some of the tuyeres cleared the metal and blew over rather than into the bath. The claim was made that by the use of this feature, extra heat was secured by burning at least part of the CO to CO_2 inside the vessel. To a slight extent, the same thing happened in the Clapp-Griffith vessel, where some of the tuyeres were close to the surface of the bath.

The Robert converter was the forerunner of the modern side-blown vessel and embodied, at least in part, the distinguishing characteristic of the latter, in that the blast is introduced from one side, and over rather than through the metal. The object of blowing at or over the surface of the bath was to imitate a method used for obtaining extra temperature in ordinary bottom blown converters, by blowing for a short time with the vessel tipped forward until several tuyeres were exposed. For many years it was claimed and believed that the extra temprature of the steel secured by blowing in this manner was due to the combustion of CO to CO_2 inside the vessel. As will be discussed in detail later, however, it is probable that the greater part of the extra heat came from the oxidation of iron to FeO, by the reaction $Fe + O = FeO$, which produces a great deal of heat.

Develop Further Modification

Even with these various modifications of standard bessemer practice, however, it proved difficult to produce a satisfactory grade of carbon steel in converters, and further modifications were resorted to. Probably the most successful of these was the method devised by Walrand and Legenisel, French metallurgists. Their process[3] is described at some length in two articles by G. J. Snelus[4] in the *Journal* of the British Iron & Steel Institute. Snelus states that blowing high-silicon metal, or adding ferrosilicon during the blow as described previously, had been practiced for some years and found unsatisfactory "because the CO carried away so much of the heat produced by the combustion of the silicon."

In Walrand and Legenisel's process, the metal was blown in a small bottom-blown converter until the silicon, manganese and carbon were largely eliminated, and the characteristic "drop (*Please turn to page* 160)

Increasing Tensile Strength

Q.—Can you supply an analysis for gray iron which will give a tensile strength of 50,000 psi? Our base iron is a 40 per cent steel mix running 1.50 to 1.60 per cent Si, 3.20 to 3.40 per cent TC, 0.50 to 0.75 per cent Ni, 0.20 to 0.35 per cent Cr, and a trace of Mo. We have difficulty in getting our carbons below 3.20 per cent, using 3000 lb iron charges, melting at about 2750 F, and by-product coke. Composition is for diesel engine and compressor work with sections from ½ to 1½ in. made in dry sand. Our tensile now runs 40,000 to 45,000 psi. Would also appreciate an analysis for ammonia compressor castings which we contemplate manufacturing. All castings are water-pressure tested.

A.—Since a number of factors enter into the production of iron which will give certain physical properties, it is difficult to make a definite reply to your inquiry on changes to increase the tensile strength of your iron. Several means are available to accomplish the desired results, but involve some experimental work to determine whether they will be effective enough to give exactly what you want without changing some other characteristic such as hardness or machinability unfavorably. Hence, all we can do is offer suggestions which might be tried.

Without making any changes in your present practice or composition, you might make a ladle addition of 0.50 per cent molybdenum to a large ladle or two and compare the results obtained with that of iron without the addition. Another procedure might be to reduce the silicon content of the charge so that the iron comes down with a silicon about 1 per cent, and add the difference in the form of ferrosilicon, etc. in the ladle with the other alloying agents. Possibly the increase of the steel scrap content of the mixture to 50 to 60 per cent or more adding part of the silicon with the iron and part in the ladle will give the desired increase in tensile strength. Your present iron or the projected higher tensile iron should be satisfactory for ammonia compressors.

Getting low carbons in cupola melting requires close attention to certain factors such as the type of coke used, low bed height and continuous tapping, rapid melting, and low carbon content raw material. Lower carbons are obtained when a hard type coke with a low combustion reactivity is employed. Also lower carbons result when the iron is melted with the minimum coke, and it is not permitted to soak in the well which means that it is allowed to run from the spout as fast as it melts. Naturally the lower the carbon in the metal charge the lower the carbon in the final iron. However, that does not mean that an all steel charge with 0.50 per cent carbon will give an iron of say 1 per cent because contact of the melting metal with white hot coke permits absorption of carbon up to the saturation point relative to the silicon content.

Determining the Riser Size

Q.—In pouring chunky castings is there any rule by which the size of the riser can be estimated so that the casting will be solid? This rule should in some manner cover the diameter of the head where it joins the casting, the maximum diameter of the head, its height, the temperature of the iron, and the moisture of the sand. There seems to be considerable guessing done, numerous articles written, but no specific data or figures. Presumably with a 6-in. cube one size head would be required which would be different than those for 12 and 16-in. cubes, or for 6, 9 and 12-in. spheres. Any references will be appreciated.

A.—So far as we know there are no standard rules for determining the size and height of the riser, except perhaps a rule of thumb method applied in many cases that the riser should not be less in diameter in the case of round, or one dimension equal to in the case of rectangular, than the section being fed. The idea presumably is to obtain a freezing rate in the riser equal to that of the section—and often the riser is made somewhat larger to insure that it stays a little hotter. Some work has been done in trying to determine riser sizes for steel castings by the British Iron & Steel Institute, but as yet that is incomplete although work accomplished so far is described in a report published in February, 1945.

Similarly an investigation by Jazwinski on steel castings published in the *Foundry Trade Journal*, Nov. 29, 1945 issue, gives the following data for feeding a 4-in. cube: 3½-in. diameter head 8 in. high with minimum neck depth of 1⅞-in., and an area of 40 per cent that of the head. Appelby in *Transactions*, AFA, Vol. 51, 1943, mentions that on heavy sections of gray iron a necking core 1¼ in. thick between riser and casting gives good results. On a 32-ft lathe bed the riser is 12 in. diameter with a 2-in. hole in the neck core. He also states that riser diameters were determined by experiment for different section thicknesses, and likewise the size of the hole

in the core. One advantage of the necking core is that the small connection between riser and casting permits the riser to be knocked off without any difficulty.

Some discussion of shrink-bob risers by Winte and Barlow in the August, 1945 issue of THE FOUNDRY gives information on diameters of the risers, size of the neck, etc. which have been found to give satisfactory results on castings of various sizes, and some of those are shown to give a clearer conception of the application. Some earlier work along the same line was described by Scott in an article in *Transactions*, AFA, Vol. 47, 1939.

Cupola Does Not Work So Well

Q.—We are having trouble with our cupola and would like to know how we can get it back to normal operation. It is lined to 36 in.; coke bed 44 in. above the tuyeres; 1000-ib iron charges; 150-lb coke splits, and air pressure is 6 oz which is the same as when it operated satisfactorily. So far as we can determine, practice is the same as previous to the trouble. Coke bed is burned through when charges are placed to the door, and blower started without soaking period. Difficulty is that a rim or bridge of iron and slag forms just above the tuyeres and causes uneven melting. Heats are about 4 tons; by-product coke is used, but no slagging. Iron comes fairly hot but not as fast or hot as formerly.

A.—Several possibilities exist which might be the cause of bridging in your cupola and those include difference in the raw materials used and their condition, difference in coke, change in the amount of air blown into the cupola, etc. With reference to raw materials it is possible that the scrap used now is rustier or dirtier than it was previously and consequently produces more slag. Coke may be larger in size and higher in ash wherein the former caused a change in melting performance, and the latter an increase in slag. Change in blast may result from wear of the blowing unit, leaks in the line from blower to cupola, low voltage to motor driving blower resulting in slower speed, etc.

We believe that the first thing to try is the addition of some limestone to each charge and some on the top of the bed. Addition of a small amount of fused soda ash may be beneficial. While the usual amount of stone employed when slagging is followed is about 60 lb per ton of iron, you might try adding around 20 lb and see how it works—increasing the amount if necessary. You mention that you are using 150-lb coke splits which seems rather high since it shows an iron to coke ratio of 6.7 to 1. We believe that you can secure hot iron with a ratio of 8 to 1 or 125 lb per 1000-lb charge.

It might be well to look into the size of the coke you are using, and see whether it is the same as formerly. We believe that the 3 x 4 in. will give the best results in your cupola. Coke should not be too large nor too small if the best results are desired. Check over your blowing unit and see that it is operating at the proper speed, and that the blast pipe is in good condition so that all the air goes into the cupola. While you mention that your blast pressure is 6 oz, it means little. Important thing is the amount of air being blown into the cupola. A handy method of calculating the amount of air required is to remember that 1 lb or 13 cu ft of air is needed to melt 1 lb iron. Hence, if you are melting 5 tons of iron per hr or 10,000 lb, you will require 167 lb or 2171 cu ft of air per minute.

Stove Lids Show Dirty Areas

Q.—We are sending a stove lid with which we are having trouble in that it runs dirty, especially in the area near the gate. Can you tell us how we can overcome such defects?

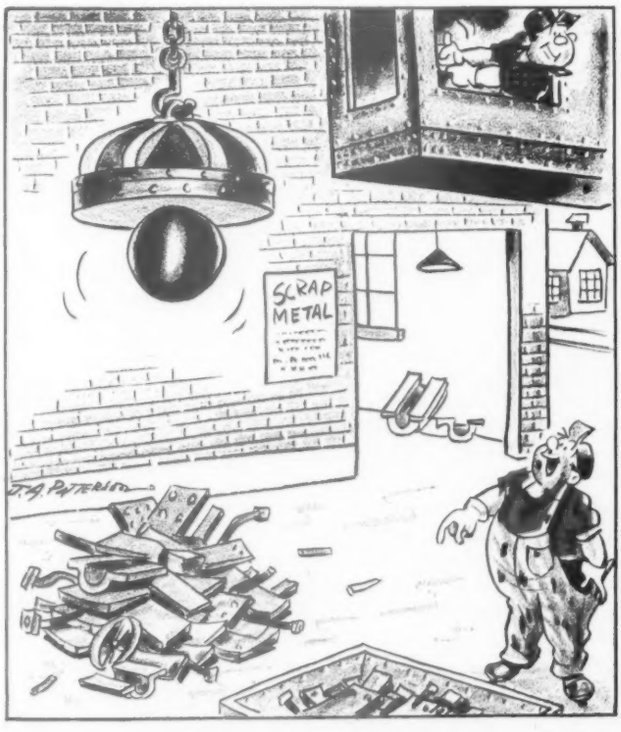
A.—Examination of the 8-in. diameter stove lid indicates that the dirty condition around the gate most likely is due to lack of good skimming and carelessness in pouring or in blowing loose sand out of the gate system. The roughened areas you mention show traces of slag and sand, and that is the reason for the suggested remedial procedure. See that the ladles are skimmed thoroughly, especially around the lip so that no slag is carried in with the metal stream.

As far as the gate system is concerned we believe that you should watch the sprue. Possibly the edges of the opening at the top are not pressed down, leaving a sharp edge with loose sand particles which are washed into the mold. Another possibility might be a slight boiling action due to an excess of moisture around the gate, or hard ramming, but that seems unlikely since the greater portion of the lid shows a fine, smooth surface. Perhaps the molds may be made early in the morning and left until late in the day for pouring which permits the sand around the top of the sprue to dry out and be washed away.

We note that you are using a rather wide gate on the lid, which presumably is made with another in a flask. We believe that better practice would be to split the wide gate into two parts, say about 2 in. or so apart. That will give a better distribution of metal and only half will flow over each gate area instead of all the metal over one place.

GANGWAY!

By J. A. Patterson



"Bombardier to pilot—bombs away!"

Permanent Mold and Die Casting Not Same

Q.—Is there a book available on die casting of aluminum, or permanent mold casting?

A.—Owing to the somewhat loose nomenclature in the foundry industry the terms die casting and permanent mold casting are applied indiscriminately to any process by which metal is cast in metal molds. In the interest of accuracy it should be pointed out that—at least in American practice—the two processes are radically different. In die casting the die or mold is placed in a machine where it is filled from a pot or reservoir of molten metal. The metal is forced into the mold under pressure. In permanent mold casting the metal simply is melted in a furnace and poured from a ladle by gravity into a metal instead of into a sand mold. One is a mechanical. The other is a hand operation.

Three books, one by Chase, *Die Castings;* one by Stern, *Die Casting Practice,* and one by Herb, *Die Casting,* cover the subject of die casting. So far as we know, no book has been written or published dealing exclusively with the subject of permanent molds. A great many articles on the subject have been presented in THE FOUNDRY and in other technical publications. An article, "Mechanized Production of Aluminum Gravity Die Castings," by John Vickers, presented at the Buffalo convention of the American Foundrymen's Association, April, 1944, appeared later in condensed form in the February and March, 1945, issues of THE FOUNDRY. The paper also is incorporated in the *Transactions* of the association, Vol. 52, 1945, page 49.

Leaks Around Partition

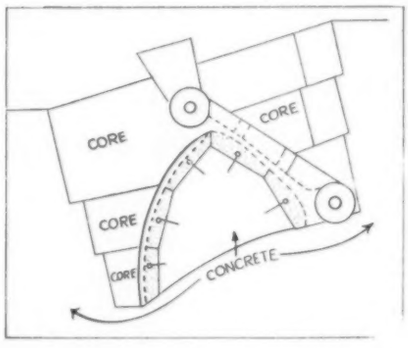
Q.—We are making some gray iron condenser castings weighing about 1180 lb which are 8 x 16 in. and 6 ft long. Metal thickness of walls is 1 in. with a partition near one end which is ½-in. thick and divides the casting into two compartments. Casting has to withstand a 350-lb water test, and we are having considerable trouble with leakage through the partition. We are using a 35 per cent steel scrap mix, and the casting is made in dry sand.

A.—Your difficulty with leakage through the partition wall undoubtedly is due to improper design in placing the ½-in. partition wall adjacent to the heavy sections resulting in an abrupt change of section at the junction. The ½-in. section cools quite rapidly in comparison to the heavy walls and tends to pull away. Our suggestion would be to go to the customer and explain the trouble you are having with the reason for it. We believe that he will be willing to permit you to increase the thickness of the partition wall to an extent which will overcome the trouble.

Probably the best method of thickening the section would be a gradual decrease from 1 in. at the wall to ½-in. at the center using a nice, generous fillet at the junction of wall and partition. While that would increase the weight somewhat, we doubt that it would be over 10 lb which in a 1180 lb is less than 1 per cent. In suggesting the increase in partition thickness we are assuming of course, that your cores forming the central openings are well vented so that the gases escape freely without creating any fluttering or disturbance at the partition.

Molding Dredge Buckets In Concrete Mold

Q.—We shall appreciate your opinion on a change we are contemplating in the method of molding manganese steel dredge buckets 14 to 17 cubic feet capacity and weight between 3000 and 4000 lb. In the present method two patterns are employed, one for the cope and one for the drag. The drag is rammed with pneumatic rammers and the cope is rammed on a jolt machine.



Slab cores are fastened to dome with hooks cast in the concrete

The mold is assembled and poured in the position shown in the accompanying free hand sketch. A single sprue extends to the bottom of the mold and a feeding riser is placed on top of the eye. In the proposed plan a concrete mold would be constructed in the floor. Dry sand cores attached to the cod with suitable hooks would form the inside of the casting, and a series of dry sand cores fitted in the concrete casing would form the outside. Suitable small holes in the concrete cod would serve to vent the slab cores. Advantages claimed for the method are that it would eliminate the need for skilled molders, and approximately double the present production of two per day.

A.—In American steel foundries manganese steel dredge buckets are made approximately in the manner outlined in the first part of the inquiry. The mold is made and dried and set up for pouring in the position shown in the sketch. However, the job is more nearly vertical. A line connecting the upper and lower eyes is practically straight up and down. The gate is carried down through the cope and enters at the bottom of the straight right portion of the piece.

The proposed method of making dredge buckets over a permanent concrete form faced with dry sand cores might work satisfactorily. You will have to use gages to check the accuracy of the core setting for the drag. Accuracy of these cores cannot be depended upon absolutely. Similarly the cores for the cope would need some adjusting. A space must be left between the outside of the cores and the concrete wall to be rammed up after the cores are set and gaged for overall size and position. For this reason the job could not be entrusted to unskilled men as you suggest. Core setters and checkers who make large castings by the core assembly method by no means can be described as unskilled.

We are not at all sure that the proposed method would show any economy over the present or standard method. To make a mold out of large dry sand cores is not always economical. Adding the overhead and the higher cost of materials, a cored mold is more expensive than a mold rammed in sand.

Requests Information On Operating Data

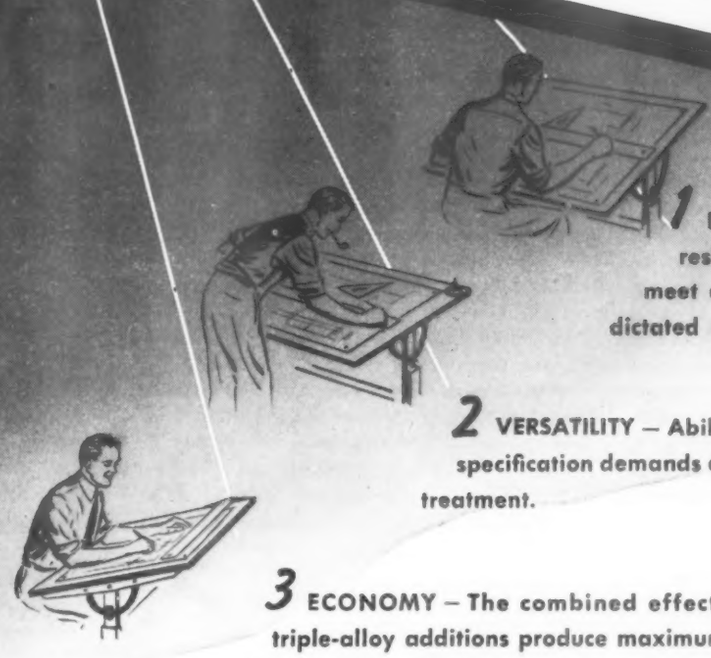
Q.—We operate a small brass and aluminum foundry for making small furniture trim parts such as drawer pulls, etc., which are intricate in design. We use both matchplates and plaster matches; cast iron flasks for plaster matches and snap flasks for matchplates. Is there any accepted percentage of rejects for that type of work? Which is the more economical to use, the solid iron, 2-part flask or snap flask? Would use of a band or jacket with the snap flask have any value? After molding we set our flasks on a roller conveyor which is tilted to process the sprue end of the flask about 2 in. higher and endeavor to produce castings so that filing is not required. Castings are ground on the gate and tumbled in a wet mill. Is that practical? Which is more economical on large volume runs; plaster match or matchplate? On our molding machines we use 75 psi air pressure on matchplate work, and 75 psi on the drag with the plaster match 55 psi on the cope. Is that practical?

A.—So far as we know the foundry loss through defective castings usually is held as low as possible, and there is no so-called standard or gage for that figure. Numerous factors enter in and they vary so widely from foundry to foundry that a 6 per cent loss in one might be con-

(*Concluded on page* 112)

Triple reasons for specifying...

TRIPLE ALLOY STEEL CASTINGS *containing* NICKEL



1 PERFORMANCE—Strength and toughness, resistance to wear, fatigue or shock to meet a wide range of requirements, as dictated by design.

2 VERSATILITY — Ability to meet varied specification demands after suitable heat treatment.

3 ECONOMY — The combined effects of triple-alloy additions produce maximum hardenability at low alloy cost.

Triple-alloy steel castings have established outstanding service records in some of the most exacting industrial applications. Many of the lower alloy types can be handled in the shop with techniques not differing greatly from those employed with carbon steels.

We invite inquiries regarding the production, treatment or uses of triple-alloy steels, containing Nickel.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N. Y.

(*Continued from page* 110)

sidered high or low in others. If the castings must pass close inspection as to dimension, surface appearance, etc., the loss figure probably will be considerably higher than where a reasonable tolerance is permitted. If you think that your losses are greater than they should be, we suggest that you segregate the losses according to different causes, and then try to reduce each one to a minimum. Through such an arrangement you can determine where the greatest trouble arises, and apply some corrective measures.

Since you are using both types of flasks—iron and snap—we should think that you would be in a better position to judge which is more economical. By segregating production runs of both types of flask, you can determine the production rates, losses and other factors that enter in, and thus determine whether there is any difference. Offhand we would guess that snapflasks might give greater production since the operator will not have as much to lift; hence becomes less fatigued. Similarly, we believe that matchplates will give higher production than with plaster matches since the operator does not have to stop and remove the match. However, the plaster match will permit an extremely tight joint between drag and cope since the two sand faces come together in making the cope. Again with a plaster match, skill of the operator in removing the pattern from the drag has much to do with the appearance of the final casting.

Jackets or bands are used to keep the cope and drag in alignment and thus prevent shifting, to make a more rigid mold, and to form a support where heavy weights may be applied. With the light castings we believe they can be dispensed with, but the decision will depend on whether you have trouble with shifts, broken edges, etc. As far as the pressure used on the molding machines is concerned, it appears that it has been dictated by experience. In the case of the matchplate, the sand rests against a firm surface in both drag and cope. However, with the plaster match a firm surface is present with the match in position in making the drag, but in making the cope the sand of that rests against the sand of the drag, and too much pressure may cause trouble. The only way to find out is to try the same pressure on both and see what happens. It certainly would eliminate the necessity of changing the air pressure, and presumably increase production, if the same pressure could be used.

Figure Operating Force On Percentage Basis

Q.—Has any analysis been made, or figures compiled to show on a percentage basis the number of molders, coremakers, etc. required in a foundry.

A.—Analysis by the National Founders Association, Chicago, of the distribution of workers among the various departments of 235 plants studied revealed that 17.9 per cent were molders; 15 per cent were employed in the cleaning room; 13.8 per cent consisted of foundry labor and 8.5 per cent were coremakers. These four classifications accounted for 55.2 per cent of the labor force, the remainder was distributed among numerous other departments. Purpose of the study was to determine what labor was used and where, and to enable foundry operators to compare their own distribution with other more or less similar plants in the field. Complete classification is shown in the accompanying table.

In chapter 56 *Elementary Foundry Technology* (2nd edition) it is stated that many who are not familiar with operations in an electric steel foundry are surprised when they learn of the large number of skilled and semiskilled trades represented: Blacksmiths, blasters, carpenters, casting chasers, casting checkers, chippers, coremakers, crane runners, cutting torch men, electricians, grinders, laboratory assistants, ladle liners and dryers, machinists, melters and furnace helpers, millwrights, molders, oven tenders (heat treating, mold and core), patternmakers (wood and metal), pattern storage tenders, sand mill operators (facing, backing and core), scale tenders, sprue cutters, steel pourers, straightening press men, welders.

Distribution of Employees in Foundry

Classifications	Composite	Type and Number of Foundries: Nonferrous	Steel	Malleable Iron	Gray Iron
	235	39	27	18	133
Molders	17.9%	17.40%	10.8%	20.2%	22.1%
Coremakers	8.5	10.66	6.8	6.4	10.5
Cleaning room	15.0	15.47	23.6	4.0	13.7
Melting	5.1	7.00	4.5	3.5	5.4
Foundry labor	13.8	13.40	10.8	14.7	15.3
Miscellaneous labor	4.3	3.50	4.1	5.0	4.9
Shipping	2.2	1.98	1.0	7.7	1.9
Maintenance	5.1	5.00	6.2	3.7	3.8
Annealing	1.2	0.60	0.8	4.2	0.9
Heat treating	0.5	0.90	0.4	0.3	0.1
Engineers	0.4	0.70	0.4	0.3	0.4
Patternmakers	2.7	2.40	1.6	2.0	3.6
Clerks	2.2	2.67	2.2	1.8	2.1
Foremen	4.1	5.00	5.3	3.5	3.8
Supervisors	1.0	1.12	1.5	1.4	0.9
Superintendents	0.7	0.92	0.6	0.4	0.7
Others on payroll	15.3	12.04	19.9	20.5	9.8

Determining Relation Of Gate Parts

Q.—Can you give an approximation of the percentage reductions between down sprues, runners and ingates in determining a natural choke on gates attached to gray iron cylinder blocks. The many theories among foundrymen on this subject are rather confusing. We are aware that there are many mechanical methods of choking, but our problem is a direct pour down the end into a bottom runner where ingates are taken off.

A.—The nearest approach to the application of scientific methods on this particular problem was described in a paper presented by Harry W. Dietert at the 1926 Detroit convention of the American Foundrymen's Association. The paper is incorporated in the *Transactions* of the association Vol. 34, pp. 1028-1048. An extensive synopsis of the paper forms part of chapter IV in *Gates and Risers for Castings*, by Pat Dwyer and published by the Penton Publishing Co., Cleveland. Illustrations, formulas and charts are too extensive to be included in the present effort. The two following formulas may furnish a basis for your calculations: The correct pouring time in seconds is represented by $S\sqrt{W}$, where W is the weight of the casting in pounds and $S=1.1$ for a casting with 7/64 to 9/64 in. stock; 1.25 for a casting 10/64 to 20/64 in., stock, and 1.5 for a casting 21/64 to 39/64 in., stock.

The rate at which molten metal will flow through a gate will depend on the the ferrostatic pressure on the reduced section of the gate known as the choke or check. The ferrostatic pressure will depend upon the height of the sprue and the location of the casting in the mold. Effective sprue height is found by the formula

$$E.S.H. = \frac{2H \times C - (P)^2}{2C}$$

Where *H* is height of the sprue above choke. *C* is the height of the casting. *P* is the height of the casting above the parting line. Area of the choke

$$\frac{E\sqrt{W}}{E.S.H.}$$

where W is the weight of casting in pounds. *E.S.H.*—Effective sprue height obtained from preceding formula, and $X=0.38$ for castings 21/64 to 39/64 stock; and 0.32 for castings 10/64 to 20/64 stock, and 0.28 for castings 7/64 to 9.64 stock.

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unless . . . *They invite a representative of E. R. Steinmann Associates, the management and industrial engineers who serve the foundry industry EXCLUSIVELY. Then something can and will be done.*

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MEN of Industry

H. H. WILDER

HOWARD H. WILDER has been appointed chief metallurgist of the Foundry Division, Eaton Mfg. Co., Detroit. Mr. Wilder was formerly research metallurgist at the Wilson Foundry & Machine Co., Pontiac, Mich. Previous connections include foundry service engineer, Vanadium Corp., Detroit; metallurgist, Detroit Stoker Co., Monroe, Mich., and the Chevrolet Gray Iron Division of General Motors, Saginaw, Mich. During the war he served with the Gray Iron Foundry Section, War Production Board, Washington. Mr. Wilder is a former secretary of the Detroit Chapter of the American Foundrymen's Association.

♦ ♦ ♦

J. E. NYHAN

J. E. Nyhan, assistant to the president of the National Founders Association for over 11 years, has resigned. Mr. Nyhan was formerly national secretary of the National Metal Trades Association and has returned to that organization for the development of a special project in the field of industrial relations.

♦ ♦ ♦

Carl T. Miller, formerly superintendent of the magnesium foundry of the Chrysler Corp.'s Dodge Chicago Plant, is president of the recently-organized Walworth Foundries Inc., Walworth, Wis., producers of nickel alloy and bronze castings. Mr. Miller attended University of Wisconsin, and for a time was metallurgist and production supervisor at the Waukesha Foundry Co., Waukesha, Wis. In 1932 he joined the Illinois Iron & Bolt Co., Carpentersville, Ill., to open and operate a nickel alloy foundry, and remained there ten years. When the use of nickel was curtailed he went to Detroit to design and lay out the magnesium foundry for Dodge Chicago Plant.

♦ ♦ ♦

A. B. Root Jr. has joined the Foster Machine Co., Westfield, Mass., as vice president and general manager. He previously had been vice president of Hunt-Spiller Mfg. Corp., Boston. Mr. Root was graduated from Tufts College in 1909, and following work with the Boston & Albany railroad and Stone & Webster Engineering Corp. joined Hunt-Spiller in 1912 as mechanical engineer. Subsequently he held the positions of assistant to the vice president, assistant to the president and assistant general manager. He was made vice president in March, 1942.

♦ ♦ ♦

R. R. Deas Jr., until recently assistant to the vice president in charge of production, the American Cast Iron Pipe Co., Birmingham, has been appointed works manager. Mr. Deas joined the company in 1914 as an apprentice patternmaker. Following completion of his apprenticeship, he subsequently worked in the engineering, foundry office, laboratories and melting departments. Later he became superintendent of the mono-cast shop, following which he spent some time in experimental and development work.

♦ ♦ ♦

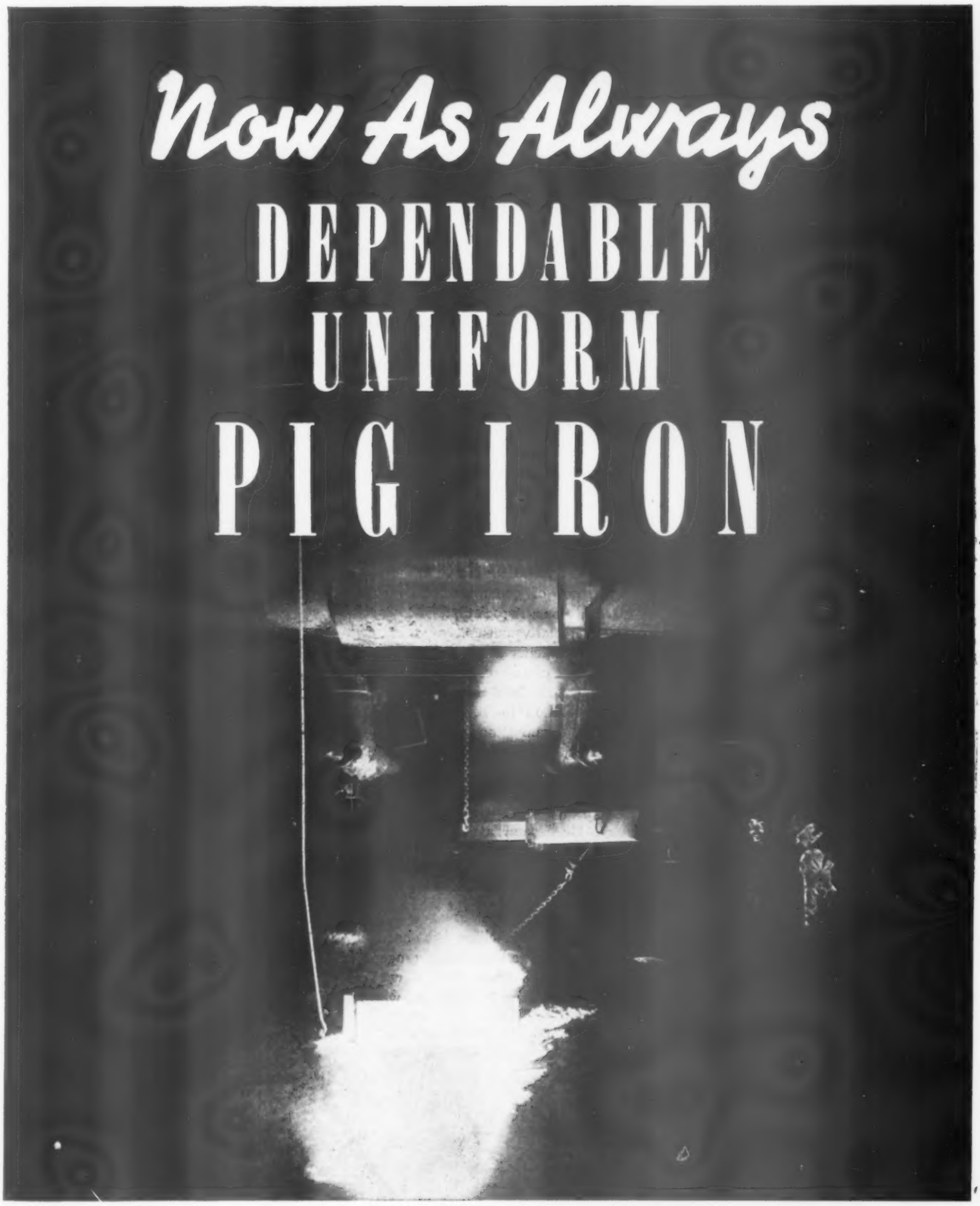
J. S. Tatman, recently president, has been elected chairman of the board of Roots-Connersville Blower Corp., Connersville, Ind., and has been succeeded as president by **John Avery.** Mr. Tatman has been with Roots-Connersville since his graduation from Purdue University in 1902. Mr. Avery, graduated

(*Continued on page* 116)

C. T. MILLER

A. B. ROOT JR.

R. R. DEAS JR.



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(*Continued from page* 114)
from the U. S. Naval Academy in 1923, formerly was with General Electric Co., later with American Brown Boveri Co. and more recently was manager of the blower and compressor department, Allis-Chalmers Mfg. Co., Milwaukee.

♦ ♦ ♦

Charles R. Reeves has been appointed works manager, Kalamazoo Stove & Furnace Co., Kalamazoo, Mich. Mr. Reeves joined the company in 1942 to manage production of parachute flares under government contract, later assisting in the layout of both of the plants he will now manage. He was formerly production engineer, Associated Engineers, Forth Wayne, Ind., production manager, Rayon Machinery Corp., Cleveland, and was earlier associated with Link-Belt Co., Indianapolis.

♦ ♦ ♦

C. B. Willmore, for the last 18 years assistant chief of process metallurgy research at the Aluminum Co. of America laboratories, New Kensington, Pa., has been appointed chief metallurgist in charge of the new research laboratories of William F. Jobbins Inc., recently built at Aurora, Ill. Mr. Willmore was associated with the Aluminum company for 27 years.

♦ ♦ ♦

Donald L. Colwell, metallurgist, recently returned from a special assignment for the Army Air Forces, U. S. Strategic Bombing Survey, in Japan, has joined the National Smelting Co., Cleveland. Prior to his mission to Japan, Mr. Colwell served as co-ordinator of conservation with the Navy Department, since 1943. He had previously been nonferrous section chief, in the WPB Conservation Division. Mr. Colwell was metallurgist and later sales manager with Stewart Die Casting Division, Stewart-Warner Corp., Chicago, for many years, leaving that company in 1939.

♦ ♦ ♦

D. P. Samson has been appointed manager of foundry sales, American Car & Foundry Co., New York. Mr. Samson was graduated from University of Pennsylvania, and worked in the experimental laboratory of the Metal Plating Co., Elizabeth, N. J. from 1914 to 1917. For the following two years he was associated with the Duesenberg Motors Co. as a tool designer. He joined American Car & Foundry Co. in 1919, and worked in the purchasing department for 11 years, when he was transferred to the sales division engaged in miscellaneous sales. In his new position he will handle the sales of chilled tread wheels, grinders and other foundry products. Mr. Samson succeeds **G. A. England,** who has been transferred to the operating division in St. Louis.

♦ ♦ ♦

Eugene D. Milener has been appointed co-ordinator of general research of the American Gas Association. **Mahlon A. Combs,** formerly assistant secretary, succeeds Mr. Milener as secretary of the industrial and commercial gas section. Mr. Milener joined the staff of the American Gas Association in 1928 in connection with the organization of the extensive program of research and development in industrial gas utilization which he has continued to supervise. Mr. Combs has had 25 years of experience in the gas industry. He became assistant secretary of the industrial and commercial gas section last September.

♦ ♦ ♦

Roger W. Batchelder has been appointed general purchasing agent of American Brake Shoe Co., New York, succeeding **William T. Kelly Jr.,** who has been elected president of the company's Kellogg Division. Mr. Batchelder, a graduate of Yale University, has been associated with American Brake Shoe Co. since 1933. For the last five years he has served in the Army Air Force from which he was recently discharged with the rank of colonel.

♦ ♦ ♦

R. F. Jordan, for the last 12 years sales and advertising manager, Sterling Wheelbarrow Co., Milwaukee, has been elected vice president. Mr. Jordan joined the company in 1918 and served successively as salesman, manager of the Boston office, and assistant sales manager. **C. A. Gehrman,** formerly assistant sales manager, has been appointed general sales manager. Mr. Gehrman became associated with the company 15 years ago as a salesman.

♦ ♦ ♦

Charles E. Andrews, a director and New England manager of Whitehead Bros. Co., New York, for the last 25 years, has retired. Mr. Andrews had been associated with the company for over 41 years. **F. B. Clark,** who joined the company 28 years ago, has been appointed New England district sales manager.

♦ ♦ ♦

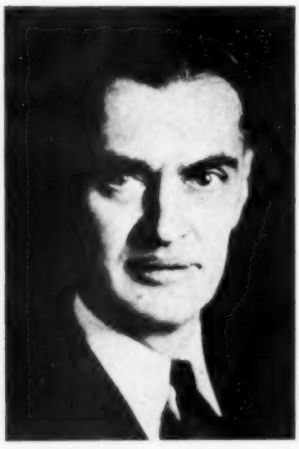
Arthur J. Olson, until recently district sales engineer, Link-Belt Co., Chicago, has been transferred to Kansas City, Mo., as district sales manager, succeeding **Max Giffey,** who has resigned after 40 years of service. Mr. Olson has been associated with the company since 1918, at the Pershing Road plant in Chicago.

♦ ♦ ♦

Edward R. Broderick has been appointed sales engineer for the New York, Brooklyn and Long Island territory of Advance Pressure Castings Inc., Brook-
(*Continued on page* 120)

C. R. REEVES

C. B. WILLMORE



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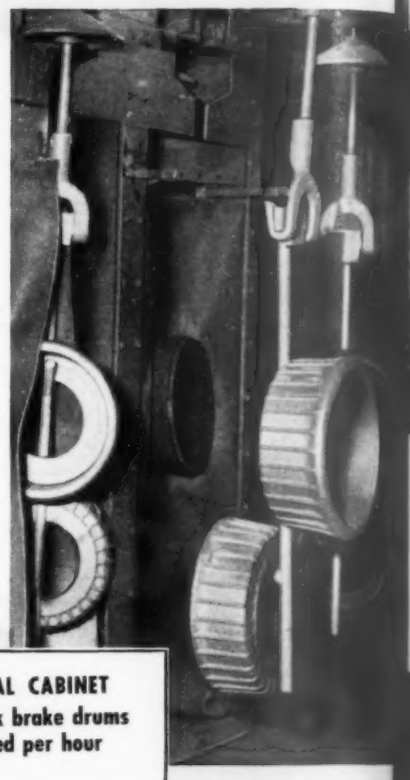

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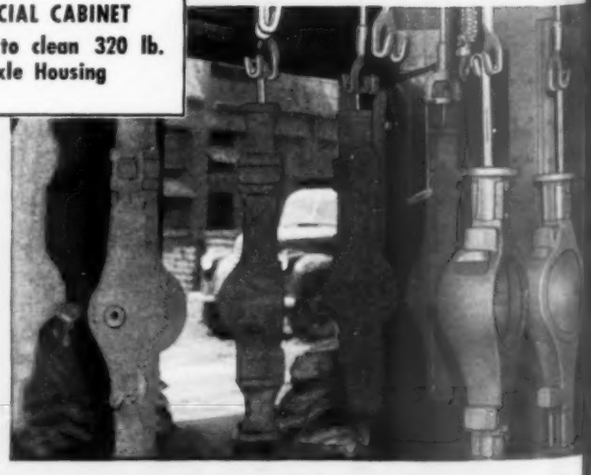
160 truck brake drums cleaned per hour

Until this Wheelabrator Special Cabinet was installed, General Foundry and Mfg. Co., Flint Mich., was able to clean only 17 of these drums per hour by tumbling.

48" x 72" TUMBLAST
3000 lbs. Steel Castings Cleaned in 10 minutes

This 48" x 72" Wheelabrator Tumblast cleans 1500 tons of green and annealed castings, including gates and risers, per month, at J. B. Beaird Co., Shreveport, La. 80% of their production goes through this one machine.

SPECIAL CABINET
1 min. to clean 320 lb. Axle Housing



This Wheelabrator Special Cabinet is used by a large Ohio malleable foundry.

Wellman Bronze & Aluminum Co., Cleveland, Ohio, uses this 27" x 36" Wheelabrator Tumblast, for cleaning aluminum, magnesium and bronze castings.

27" x 36" TUMBLAST
10 Magnesium Wheels (25 lbs. each) cleaned in 5 minutes

for PAYLOADS

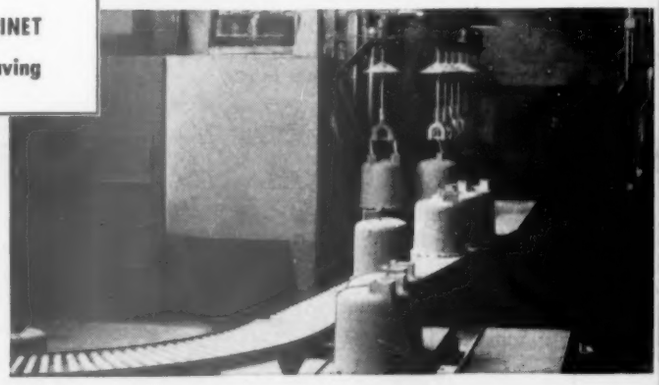
9′ MULTI-TABLE
6 Airplane Engine Heads Cleaned in 3 min.

This No. 3 Wheelabrator Table is used in the plant of a prominent aircraft engine builder.

48″ x 72″ TUMBLAST
40 to 45 Tons Steel Castings Cleaned in 8 hours

Crucible Steel Castings Co., Milwaukee, Wis., uses two 48″ x 72″ Wheelabrator Tumblasts, each of which cleans 40 to 45 tons of castings daily. One machine cleans green castings, the other annealed castings.

SPECIAL CABINET
50% Cost Saving



These 120 lb. railroad castings are cleaned in a Wheelabrator Special Cabinet. Previous cleaning cost was 17.1c each. Present Wheelabrating cost is 8.4c each.

SWING TABLE
330 lb. Furnace Casting cleaned in 4 min.

Four hours were formerly required to tumble 3 of these castings at Premier Furnace Co., Dowagiac, Mich. (Note the small castings being cleaned with the large one.)

The Airless WHEELABRATOR

American

FOUNDRY EQUIPMENT CO.

505 South Byrkit Street, Mishawaka, Indiana

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

(*Continued from page* 116)

lyn, N. Y., with headquarters in that city. Mr. Broderick, until recently, was designing and development engineer on bombs and bomb fuzes for the government.

♦ ♦ ♦

William C. Wick, until recently specialist (X) 1/c in the Steel Castings Section, Division of Physical Metallurgy, Naval Research Laboratory, Washington, has been released by the Navy and has returned to Armour Research Foundation, Chicago, as assistant metallurgist in the Metals Division. Mr. Wick, who had served at the Naval Research Laboratory since May, 1944, was instrumental in developing the use of insulating riser sleeves and pads for producing sound bronze castings, while there. Prior to his service in the Navy he spent four years with the Armour Research Foundation, working on new methods and techniques for producing castings.

♦ ♦ ♦

E. C. Conary has become affiliated with the department of engineering research, National Engineering Co., Chicago. Beginning his foundry career with American Steel Foundries in 1933 at the Granite City, Ill., works, he subsequently attended the Missouri School of Mines and Metallurgy, Rolla, Mo. After graduation in 1942, he returned to American Steel Foundries as chief chemist of the Cast Armor plant, East Chicago, Ind. Upon cessation of operations of this plant in 1945, Mr. Conary was transferred to the company's East Chicago research laboratory as foundry research metallurgist.

♦ ♦ ♦

Frank Robbins Jr. has formed a partnership with **Herman F. Bohr Jr.** to conduct the Robbins Equipment Co., Chattanooga, Tenn., in the sale of foundry and other types of industrial equipment. Both men were with the United States Naval Reserve during the war. Mr. Robbins was graduated from the University of the South in 1932 and received his industrial experience in Chattanooga where he was successively with the Mountain City Mill Co., Ross-Meehan Foundries, Soutex Machine Co. and Industrial & Foundry Equipment Co. He was with the procurement division of the Navy Bureau of Supplies and Accounts, Washington, in 1944 and until November, 1945.

Mr. Bohr, graduated from the University of Chattanooga in 1933, was with Gulf States Steel Corp., Gadsden, Ala., for a year, spent eight years with Vance Iron & Steel Co., Chattanooga, one year with Trinler Inc., Chattanooga, and from 1943 until January, 1946, was with the Naval Reserve at Louisville under the Supervisor of Ships, LST program.

♦ ♦ ♦

William C. Domino, for nearly 20 years sales and field engineer for the West Steel Casting Co., Cleveland, has resigned to join the Swedish Crucible Steel Co., Detroit, as representative in northern Ohio. Mr. Domino was engaged in procurement work for the Foote-Burt Co., Cleveland, for seven years before going with West Steel Casting Co.

♦ ♦ ♦

W. R. DeGowin, metallurgist and inspection engineer, the Detroit Testing Laboratory, Detroit, since 1927, has been appointed general manager and a member of the board of directors of that organization. Mr. DeGowin, a graduate of the University of Michigan, held responsible positions with Studebaker Corp., Packard Motor Car Co., Dodge Brothers, and U. S. Bureau of Aircraft Production, before joining the laboratory. Other officers elected at the annual meeting of the company include: **W. P. Putnam,** president; **J. D. Stoddard,** vice president; **Henry J. Jameson,** treasurer; **Mary E. Black,** secretary; and **Helen Minch,** assistant treasurer.

♦ ♦ ♦

Nelson F. Wilmot has been appointed Chicago district sales manager, the Mathieson Alkali Works, New York. Mr. Wilmot attended Massachusetts Institute of Technology and has been associated with the company since 1931. **Merle S. Clark** has been appointed district sales manager in charge of the new branch office recently opened in St. Louis. Mr. Clark was graduated from the University of Indiana and taught chemistry and physics for several years before he entered the industrial chemical field. He joined Mathieson in 1931.

♦ ♦ ♦

Lt. R. A. Colton, formerly stationed at the Naval Research Laboratory, Washington, has been released from active duty in the Navy and has joined the staff of the General Research Laboratory of the American Smelting & Refining Co., Perth Amboy, N. J.

♦ ♦ ♦

William D. Todd has been appointed assistant to the president, Aetna-Standard Engineering Co., Youngstown, O. During the war Mr. Todd was a member of the Harriman Mission in London and later was director of the Steel Division, War Production Board, Washington.

♦ ♦ ♦

Henry L. LeMay has been manager of the Chicago office and warehouse of Bay State Abrasive Products Co.,

(*Continued on page* 122)

W. C. WICK

E. C. CONARY

FRANK ROBBINS JR.

H. F. BOHR JR.

A cyclone and a Sly Dust Filter collect dust from grinding and sandblast operations on non-ferrous castings. The Sly Dust Filter is needed to collect completely all the fine dust which the cyclone could not catch.

SLY DUST Control Gets ALL the Dust —EVEN THE VERY FINE DUST

it is the FINE DUST which does the damage . . .

The *fine dust* works its way into the bearings and other moving parts of machinery and settles widely over plant and neighborhood.

Only the *fine dust* is injurious to the human body. The coarser particles are stopped by the nose and mouth; only the very fine particles enter the respiratory system.

A combination of a Sly Dust Filter and a cyclone Collector is not uncommon. Often the cyclone does not collect the fine dust. Then a Sly Filter is added to get it all.

Sly Dust Collectors are not expensive —in first cost, maintenance, operation. Ask for Bulletin 98 and tell us your problem so that we can write you fully.

THE W. W. SLY MANUFACTURING CO. • 4753 TRAIN AVENUE • CLEVELAND 2, OHIO

SLY INDUSTRIAL DUST CONTROL

TUMBLING MILLS • BLAST CLEANING EQUIPMENT

(*Continued from page* 120)

Westboro, Mass. A graduate of Worcester Polytechnic Institute, Mr. LeMay at one time was associated in manufacturing and sales with Duesenberg Motors Co., Indianapolis; Mercedes Benz, California; and Lincoln Motors in California. For the last three years he has been associated with Norton Co., Chicago, in abrasive sales work.

♦ ♦ ♦

Harry G. Reddig, recently associated with the Paasch Aluminum Foundry, Moline, Ill., has established the Reddig Aluminum Foundry, Rock Island, Ill., for the production of light and medium weight aluminum castings. Mr. Reddig was with the Keokuk Steel Casting Co., Keokuk, Iowa, for ten years, later was with John Deere Plow Works, Moline, for two years and before going with Paasch Aluminum Foundry spent six years with the Rock Island Arsenal.

♦ ♦ ♦

George A. Fuller Jr. has been appointed branch manager in Detroit for the Federal Foundry Supply Co., succeeding his father, George A. Fuller Sr., who died Feb. 26. He became associated with his father in the foundry supply business in the Detroit area last fall, following his release from the Army after three years of overseas service.

♦ ♦ ♦

Lt. Comdr. J. Elbert Johnson, Maj. J. Frank Curry, and **Lt. Jack E. Williams,** recently released from active duty with the Armed Forces, have returned to Alabama By-Products Corp. and its subsidiary, ABC Coal & Coke Co., Birmingham, as sales representatives.

♦ ♦ ♦

Dr. Daniel S. Eppelsheimer, until recently acting director of the engineering experiment station of the University of New Hampshire, has been appointed sales manager and chief physical metallurgist, Metal Hydrides Inc., Beverly, Mass.

♦ ♦ ♦

John Quinn, manager of the Canton, O., plant and a director of United Engineering & Foundry Co., Pittsburgh, has been elected chairman of the board of directors of Adamson United Co., Akron, O. The latter is a subsidiary of United Engineering & Foundry Co.

♦ ♦ ♦

Frederick A. Preston, vice president, Poor & Co., Chicago, and **Brig. Gen. Thomas S. Hammond** (retired), chairman, Whiting Corp., Harvey, Ill., have been granted the War Department award for exceptional civilian service in recognition of their work as chiefs of the Chicago Ordnance District. The former was district chief from March, 1935, until July, 1942, and the latter served in the same capacity from September, 1942, until June, 1944.

♦ ♦ ♦

H. E. Arblaster, chief metallurgist, Stokes & Sons, and its subsidiary company, Stokes Foundries Pty. Ltd., Melbourne, Australia, is the author of the first exchange paper from the Institute of Australian Foundrymen to the American Foundrymen's Association. The paper

H. E. ARBLASTER

entitled "Manganese Bronze," will be presented at the coming annual convention of the AFA in Cleveland. Mr. Arblaster received his degree in metallurgical engineering in 1935 from Melbourne University. After experience in the primary metallurgy industry, he spent four years in the electric welding field as chief metallurgist of E. M. F. Electric Co., Melbourne, before becoming associated with Stokes & Sons. **Lester B. Knight,** Lester B. Knight & Associates, Chicago, is the author of the AFA exchange paper on the subject of mechanization which will be presented to the Australian institute.

♦ ♦ ♦

R. K. Wescott has retired as treasurer of the Almont Mfg. Co., Imlay City, Mich., after 27 years with the company. During that time he was also a member of the board of directors. A recent dinner given in his honor was attended by directors, supervisors and present office staff. The average length of service for all in attendance was 17 years, with five over 20 years. **L. V. Wickson** has resigned as production manager of Almont to become general manager of the Die Tool Engineering Co., Alpena, Mich.

D. D. Bowman has returned to Almont after 3½ years as a captain in the Ordnance Department, on the forge and foundry committee. He has taken over Mr. Wescott's duties and is also in charge of sales. Other recently elected officers include: **Charles D. Ferguson,** president; **P. W. Mulder,** vice president and general manager; **J. W. Lierman,** secretary-treasurer; **D. D. Bowman,** assistant treasurer; and **G. A. Rogers,** plant manager and superintendent.

♦ ♦ ♦

Melvin C. Shaw has been appointed manager of the blower and compressor department, Allis-Chalmers Mfg. Co., Milwaukee, succeeding **John Avery,** who has resigned to become president of a blower corporation in Indiana. Mr. Shaw, a graduate of the University of Washington, joined the company in 1914, and has been chief engineer of the blower and compressor department since 1935. Mr. Avery, manager since 1944, joined Allis-Chalmers in 1931 when the company acquired the Brown-Boveri interests.

♦ ♦ ♦

Allen B. Williams has been made president of the Aluminum Ore Co., subsidiary of Aluminum Co. of America, succeeding **Charles B. Fox,** who has retired. Mr. Williams has been associated with the Aluminum company for almost 34 years, and had been vice president of the Aluminum Ore Co. since 1942.

♦ ♦ ♦

William H. Summers, until recently Washington district manager for the mechanical goods division of the Goodyear Tire & Rubber Co., has been transferred to Cleveland, in a similar capacity, succeeding **R. E. Britt,** who will have charge of the Central States Industrial Supply Co., new Goodyear jobber in that city.

♦ ♦ ♦

A. T. Brandt has been appointed sales manager of the Minn-Kota Foundry & Mfg. Co., Fargo, N. Dak. and Moorhead, Minn. He was formerly secretary of the Moorhead Chamber of Commerce.

♦ ♦ ♦

A. Triquet, managing director, Societe Anonyme des Machines Osborn, Paris, foreign branch of the Osborn Mfg. Co., Cleveland, was in this country recently on a business trip.

♦ ♦ ♦

J. Robert Kelley has been appointed executive vice president of Manning, Maxwell & Moore Inc., New York. Mr. Kelley joined the company in 1930 as general manager of the mill supply division, became vice president in 1938 and, a year later was made general sales

(*Concluded on page* 124)

Molybdenum in cast iron promotes uniform hardness in varying sections.

MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

Climax Molybdenum Company
500 Fifth Avenue · New York City

MOLY

(*Concluded from page* 122)

manager of the Shaw Box Crane & Hoist Division, Muskegon, Mich. He has been assitant to the president since 1942.

♦ ♦ ♦

Harbison-Walker Refractories Co., Pittsburgh, announces the appointment of four new assistant district sales managers. They include: **E. S. Stockslager,** New York; **E. M. Sarraf,** Cleveland; **H. S. Schweinsberg,** Philadelphia, and **J. H. Owen,** Chicago. All of these men have served the company as representatives for a number of years and are well known in the districts to which they have been appointed.

♦ ♦ ♦

T. A. McMahon has been appointed manager of purchases, J. D. Adams Mfg. Co., Indianapolis. Mr. McMahon will have charge of purchases for production material as well as equipment and supplies, two departments which have been consolidated.

♦ ♦ ♦

Robert L. Featherly, recently released by the Navy, has returned to the Dow Chemical Co., Midland, Mich., as a member of the magnesium sales staff on cathodic protection. Mr. Featherly, a graduate of Michigan State College, was formerly in the engineering department of the company. **Francis T. Furman** has been transferred from the Midland to the New York sales office, as a member of the magnesium sales staff. **Donald H. Gilmore** has joined the magnesium sales staff in the Cleveland office. Mr. Gilmore, a graduate of Tri State College, has been associated with the landing gear division of the Bendix Aviation Corp., South Bend, Ind., for the last six years.

♦ ♦ ♦

Howard N. Verrault has been appointed to the sales staff of Velsicol Corp., Chicago, with headquarters in the company's New York office. Mr. Verrault, recently discharged from the Navy, attended Cornell University, and was engaged in sales activities for an eastern producer of coatings and finishes for several years before entering the service.

♦ ♦ ♦

Lewis L. Dollinger Jr., following 5 years of military service which included more than two years of overseas duty as officer of an anti-aircraft battalion in the European Theatre, has resumed his duties with the Dollinger Corp., Rochester, where he recently was elected vice president.

IN APPRECIATION: Harold S. Falk, the Falk Corp., Milwaukee, receives the War Department's certificate of appreciation from Brig. Gen. Roger M. Wicks, acting commanding general of the 6th service command, in Chicago. Mr. Falk has served as civilian aide to the secretary of war for Wisconsin since 1931. (Photo by U. S. Army Signal Corps.)

Ellsworth H. Sherwood has been appointed New York and New England district manager of the railway sales division, National Malleable & Steel Castings Co., Cleveland, with headquarters in New York. He succeeds **Charles Gaspar,** who has retied after 30 years' service with the company. Mr. Sherwood attended the University of Michigan and joined National Malleable in 1920. **Floyd Snyder,** who has been associated with the New York sales office since 1911, has been appointed sales agent there. **George F. Wilhelmy** has been made sales agent in the railway division's Cleveland office. Mr. Wilhelmy has been with the company since 1905.

♦ ♦ ♦

Maj. R. H. Munn Jr., after 6 years of active duty in the Chemical Warfare Section of the Army, has returned to the Pittsburgh office of Ampco Metal Inc., Milwaukee, as manager and field engineer in the Pittsburgh territory. **W. J. Nebel,** Wisconsin district field engineer, has been transferred to the New Jersey district, in that capacity, with headquarters in Newark.

♦ ♦ ♦

Clarence L. Smith has been appointed Detroit district manager for the grinding machine division, Norton Co., Worcester, Mass., succeeding **Oscar A. Knight,** who has retired after serving the company for 40 years. Mr. Smith joined Norton Co. in 1923 and for the last 7 years has been sales engineer of the grinding machine division.

♦ ♦ ♦

Maj. C. W. Henkle has resumed his position as vice president, Mercury Mfg. Co., Chicago, after 3½ years with the Army Air Forces.

♦ ♦ ♦

Lt. Comdr. C. S. Munson Jr., after 4½ years of active duty with the Navy, has returned to the Vanadium Corp. of America, New York, where he has been appointed assistant to general manager of sales.

♦ ♦ ♦

William G. Pinkstone, formerly vice president of the West Co., Philadelphia, has been made vice president of General Grinding Wheel Corp., and executive vice president of West Abrasives Inc., that city.

♦ ♦ ♦

Lothair Teetor has been elected chairman of the board of the Perfect Circle Co., Hagerstown, Ind. **Ralph Teetor** has been named president and **Macy Teetor,** vice president in charge of engineering.

♦ ♦ ♦

Paul K. Povlsen has resigned as vice president in charge of production, J. I. Case Co., Racine, Wis.

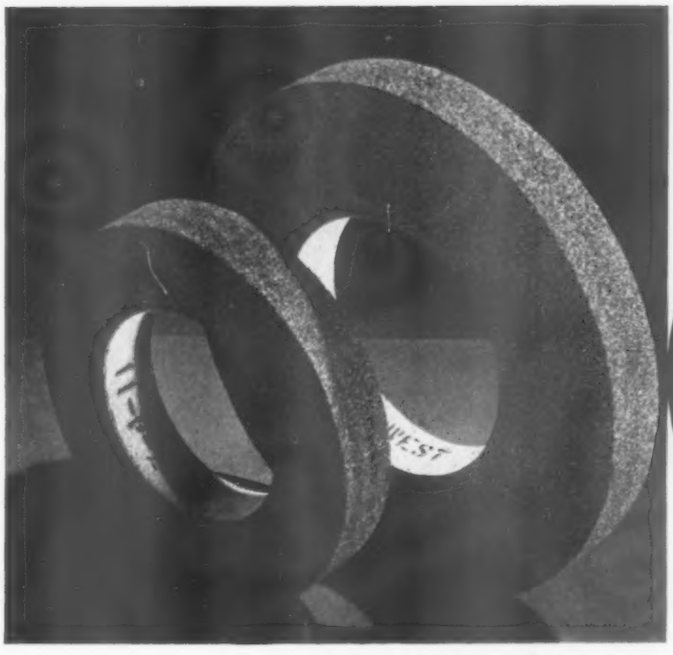
One sure way to clean up cleaning room problems is to equip your cleaning room with Mid-West Abrasives.

The products of the Mid-West Abrasive Company — snagging wheels, disks, cones and other foundry type abrasives —are especially designed and manufactured for the production demands of today.

Performance is the yardstick you use to measure the quality of the abrasive you buy. Apply that yardstick to Mid-West products, and you'll find your cleaning problems solved.

Switch to Mid-West today!

CLEAN UP WITH MID-WEST ABRASIVES



MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE ALrasives

OWOSSO, MICH. • DETROIT

ROCHESTER, PA.

foundry DEVELOPMENTS

WHILE stack or multiple molding wherein one mold contains the cope cavities in the lower face and the drag cavities in the upper face is not a new procedure, a recent development practically elevates the practice to the "not touched by human hands" category applied to food products. Essentially the new method developed by the International Molding Machine Co., Chicago, involves a combination of machines mounted on a common base with a conveyor transporting the patterns from one station to another. Movements are timed and controlled electrically. Main squeeze elements and all positively controlled movements are actuated with hydraulic cylinders—main squeeze exerting a 50-ton pressure. Initial installation uses round flasks since it is believed they will permit uniform distribution of squeeze, and exhibit the least distortion.

• • •

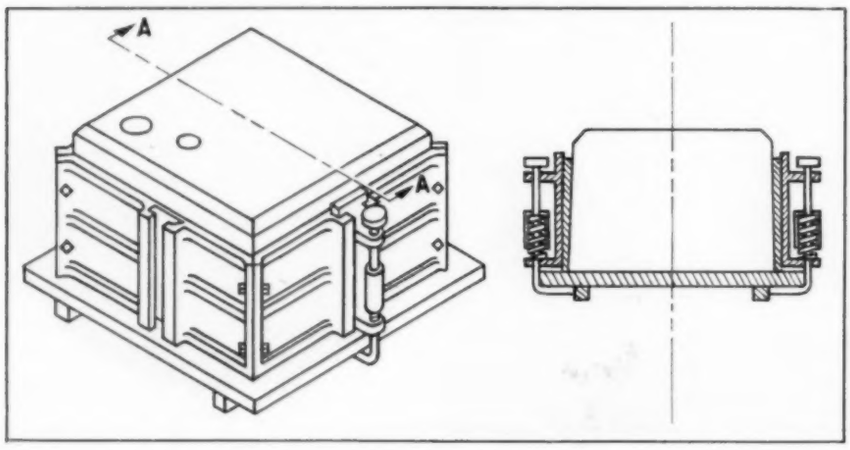
LATEST development in pulverization of coal is the application of a process used to process patented breakfast food and wood fiber for press board. Popular terminology for the procedure is "shot from guns" wherein the coarse product in sealed containers is subjected to high steam pressure. The container suddenly is opened to atmospheric pressure, and the rapid expansion of the steam in the pores of the material causes bursting. While the process as applied to food and wood fiber is intermittent, the present application to coal pulverization is continuous in which the coal ground to 16 to 30 mesh passes in a stream of steam or compressed air through a venturi type nozzle. Sudden expansion upon leaving the nozzle disintegrates the coal into dust. Test methods and results described by Yellott and Singh at the recent ASME meeting indicate that with steam pulverization the moisture content seldom exceeded 1 per cent even with low superheat in the steam and coal of high initial moisture content.

• • •

INGENIOUS method developed by Westinghouse Electric Corp. engineers for coring long holes in an aluminum bronze casting is said to have increased production five times, reduced drill breakage, and substantially reduced cost. Formerly the holes were drilled in the metal with long thin drills which broke frequently and were difficult to replace. New method is to use inexpensive carbon rods which after the casting has solidified can be pushed out with steel pins. Holes are brought to final finish by drilling out remaining carbon which procedure also straightens the walls.

• • •

TO ELIMINATE the use of weights which may cause mold crush and dirt, Frank Madrigal, Tulsa, Okla., has developed the idea shown in the accompanying illustration and on which he has applied for a patent. He has used this idea for some time and finds it quite efficient. The mold jacket has a 5° taper and four clamp guides. The clamp slides up or down in the guides, and with only a quarter turn of the clamp, the jacket is claimed to be clamped securely to the bottom board.



REASON for the surprisingly effective increase in hardenability of steel by minute percentage of boron is because the boron atoms are located principally in the grain boundaries prior to transformation and are not randomly distributed in austenite as are atoms of other common alloying elements which increase hardenability. Presence of boron atoms in austenite grain boundaries lowers the rate of grain boundary nucleation which is the controlling factor in the upper region of rapid transformation, and thus increases hardenability.

• • •

NEW process by which metal, wood, cloth, leather, plastics and almost any other surface can be made usable for photographic reproduction soon will be made available by Glenn L. Martin Co., Baltimore. Basis of the process is an emulsion which can be spread on various materials to sensitize them for photographic printing. In its normal state the emulsion is a thin jelly-like substance which when heated to 125 F becomes a liquid which is applied to the surface with a camel's hair brush, sponge or soft rag. Allowed to dry the negative is printed by contact or projection, and development proceeds normally as on commercial paper. All operations are carried on under darkroom conditions using ruby lights. During the war the process was used by Martin for making full scale engineering drawings on steel, wood, etc.

• • •

TESTS conducted by the Bureau of Mines on the application of electrolytic manganese in the production of acid steel indicated that it proved entirely satisfactory, and carbon steels had slightly better physical properties. Investigations were carried out on full-scale commercial heats at Atlas Steel Casting Co., Buffalo, N. Y., and Detroit Steel Casting Co., Detroit. At the Atlas foundry electrolytic manganese was added in the ladle to 8 openhearth heats and either in the furnace or ladle to 7 electric furnace heats. Steels were low to medium carbon grade. At Detroit Steel electrolytic manganese was added in the ladle to two heats of carbon steel and one heat of low alloy steel. Comparative heats were made in which the entire addition of standard ferromanganese was made in the ladle and melting conditions were duplicated as closely as possible. In both plants efficiencies were at least as high as those normally attained with ferromanganese. Price is a deterrent to the use of electrolytic manganese at present, but it is said a substantial reduction can be expected when the metal is produced on a scale large enough to attain minimum costs. E. B.

You Get Quick Collapsible Cores With
KRAUSE
Truscor AND Amerikor
(LIGHT WEIGHT)
CEREAL BINDERS
(HEAVY WEIGHT)
A small percentage added to your mix will:
Supply proper green bond to sharp sand
Give smooth performance in core boxes
Reduce core and cleaning costs
Bring out fine detail

SHOWN above is an unretouched photograph of a number of malleable cores made with Krause Cereal Binder where collapsibility is important. Notice the accurate detail . . . the smoothness of surface . . . the sharp, unbroken edges. Figure it out for yourself what it would mean in your foundry to have such cores . . . to have them easier . . . at lower cost . . . with fewer rejects. Truscor and Amerikor are made to the most exacting standards. The result is a combination of unvarying quality, greater binding strength in the green and dry core stages, increased permeability, less sticking, easier ramming—and increased production of better cores. On your next order for cereal binder, specify Truscor or Amerikor. Phone, wire or write outlining your core problem in detail.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wis. · ***World's Largest Millers of Dry Corn***

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M. A. Bell Co., St. Louis 2, Mo.
A. L. Cavedo & Son, Inc., Richmond 21, Va.
Foundry Supplies Co., Chicago 16, Ill.
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Independent Foundry Supply Co., Los Angeles 11, Calif. Seattle 4, Wash.
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Carl F. Miller & Co., Milwaukee Chaplet & Mfg. Co., Milwaukee 4, Wis.
Pacific Graphite Works, Oakland 8, Calif.
Porter-Warner, Chattanooga 2, Tenn.
Smith-Sharpe Co., Minneapolis 14, Minn.
Frederic B. Stevens, Inc., Buffalo 12, N. Y.
Frederic B. Stevens, Inc., Cleveland 14, Ohio
Frederic B. Stevens, Inc., Detroit 26, Mich.

Around DETROIT

BY A. H. ALLEN
Detroit Editor, The Foundry

Casting procurers have their troubles but they reflect the difficulties plaguing suppliers. . . . Resume use of permanent mold aluminum castings for most passenger car engine pistons

HE WAS a sad-looking individual as he twirled the remnants of a glass of beer and bemoaned his troubles as "follow-up" man on castings for the purchasing department of a large truck builder. His acid comments reflected the sentiments of nearly everyone in this type of work and, by inference, the seemingly endless difficulties plaguing castings suppliers. "Wotta life," he mused, "here we got schedules laid out for umpteen thousand new trucks and buyers screaming for them, and I go scrambling all over the country trying to find somebody to make a few thousand lousy gray iron castings, and about all I get is one brush-off after another.

"One guy says he'd just love to take care of us, but he just negotiated a new labor contract to pay his help 15 cents an hour more and still he can't get a nickel more for his castings because ceiling prices still apply, on truck stuff as well as on passenger cars—so he's sorry, we'll just have to count him out.

"Another guy says maybe he can ship us something in 90 days and when I say, hell, we have to get 12,000 trucks out in the next 90 days, he says how interesting—and that's that.

"Another guy takes me out in his shop to look around. The superintendent comes up and says he is damned if he knows how to get any work out of the force, even after giving them a nice raise. He says it used to be that the gang would pitch in and heave from 7:30 in the morning until quitting time and really bat out some castings. Now they have to go to the powder room about every hour, take a little time off for a smoke, or show up for work maybe every other day. And they're always complaining it's either too hot or too cold, or some job is too heavy, or some foreman is being mean to them.

"Another guy who is doing a fair job shipping us stuff got to reminiscing the other day and tells me about the time during the war when he imported a couple hundred full-blooded 'treaty' Indians from up in Canada north of the Soo to work in his plant. First time they ever been in the States and they bring their whole mob, squaws, papeese and all, down with them. So he had to set up a trailer camp to take care of them—didn't want them pitching tents in the main street. Well, most of them prove to be hard workers and in a few weeks latch on to more cash then they ever dreamed existed. But they have one bad fault—they like the firewater too much, and when some of those Indians get loaded trouble really breaks loose. Even the squaws like to lap the stuff up and when they are high they are worse then the men. The local jail was kept full of them most of the time, but when the fishing season started they all trooped back up north and that's the last ever seen of them."

Our friend went on in this despairing vein for a time, but there was little we could offer in the way of consolation. Perhaps it is all part of a national post-war hangover that will wear itself out in time, but meanwhile production continues to limp and falter, and managements seem unable to do much about it.

* * *

A GROUP of visiting French "Industrialists" spent a couple of days in Detroit a few weeks ago, stopping off on a tour of manufacturing centers they were making. They included ten representatives of the electrical construction industry, six foundrymen and two from the hotel-restaurant trade. They called themselves "jeunes patrons" which literally translated means young managers. With a somewhat limited ability to speak and understand French, this observer was given to understand the visitors—most of them probably in their thirties—were interested in seeing how American industry had geared itself to produce the

(*Concluded on page* 130)

RENAULT FOUNDRY: Pouring a mold at the Billancourt, France, plant of the Renault Automobile Works. Privately owned before the war, this company is resuming production as a nationalized organization under the program of state control of France's basic industries. (NEA photo)

Mathews

ROLLER CONVEYERS

Engineered to serve Production

Roller Conveyer for foundry application should be designed to withstand severe service. The rollers must be rugged and free-running, and the bearings should be protected from grit and dirt. If the conveyers are located in a pouring zone, shotguards should be used on the ends of the rollers. Mathews Engineers have devoted much time and effort toward developing an outstanding Roller Conveyer design for foundry application. There is a Mathews Engineer operating in your vicinity. Ask him about Roller Conveyer and the many other types of Mathews Conveyers which have been engineered for foundry service. He will show you why Mathews Conveyers are able to stand up under the most severe foundry applications. Write or wire today.

Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA

(*Concluded from Page* 128)

tremendous volume of war goods which flooded European battlefronts. They wanted all the literature, books, magazines and technical commentaries they could lay their hands on. They wanted to know where to buy machinery and equipment. They wanted to emphasize that "you in America must help us by extending credit so we can buy raw materials and manufacturing equipment."

The visiting Frenchmen flew to this country via Ireland, Newfoundland and New York, in a Lockheed Constellation, STAR OF ROME, and said the round trip cost them about $650 each. Arrangements were made by the American Express Co., and in Detroit they were guests of the junior board of commerce. Stopping at several plants here, they were most impressed by Willow Run, which is strange considering the fact the plant is practically bare of all equipment save a few paint ovens which the Kaiser-Frazer Corp. has installed preparatory to assembling passenger cars some day. The building is impressive for its size, but right now that is about all.

* * *

PRACTICALLY all 1946 models in the passenger car field have resumed the use of permanent mold cast aluminum pistons. Chrysler, De Soto, Plymouth and Dodge were the last to annouce 1946 specifications, and all carry U-slot cast aluminum pistons. However, a new practice, to eliminate initial scuffing during run-in is to brass plate the sidewalls. Brass is more or less of an expedient in this application, tin being the usual coating material. Continued shortage of tin, carrying over from the war years, dictated the change to brass which should prove equally efficient.

Other tin conservation measures noted by Chrysler include a new body solder which carries no tin, and the spotwelding of gasoline tank fittings in place of soldering, with a plastic gasket used where a seal is necessary. In certain other places where a tin solder has been called for in the past, a new solder with only 10 per cent tin instead of 40 per cent has been developed. Result is that one ton of tin now fills requirements for 1000 cars, compared with only 480 in 1940, a saving of well over 50 per cent.

Assembly lines throughout the industry, except for General Motors and Packard, are moving, but that is about all. Nash reports schedules are being forced lower because of inability of suppliers to keep parts moving in volume, a situation ascribed principally to the wageprice squeeze previously referred to.

Encouraging word comes from South Bend where Studebaker is planning to introduce shortly its redesigned and restyled President and Commander models, hitherto not in production. They will be designated as 1947 models and will be carried right through the balance of this year and next, avoiding any changeover this fall. The proposed national automobile show in New York this fall, incidentally, has been canceled and will not be scheduled until some time in 1947.

Frederic B. Stevens Inc., long-established foundry supply house here, is looking forward to transfer of its main offices and plant from the present Third street address to a location on Detroit's west side, near the Michigan Central railroad terminal, where it has purchased a building and will undertake expansion and refitting. The present location stands in the path of a proposed new city expressway, still some years off. The company also operates a facing mill on Twenty-second street on the west side, and an extension of this property is contemplated.

Federal-Mogul Corp. is laying out a new brass propeller foundry for local operation. During the war the company operated a plant at Greenville, Mich., for this type of work.

To Make Permanent Mold Castings

The Dostal Per-Mold Foundry Co. Pontiac, Mich., has been formed for the production of permanent mold gray iron castings, with Joseph L. Dostal general manager of the new company. Mr. Dostal, former vice president and general manager of the Foundry Division, Eaton Mfg. Co., Detroit, has been active in the permanent mold casting field for more than 20 years. Patents issued in his name led to formation of the Holley Permanent Mold Machine Inc., where he was general manager for many years.

J. L. DOSTAL

The new company will occupy a plant purchased from the Die Typing Corp., Pontiac, and expects to employ 200 men. Associated with Mr. Dostal as principal though inactive partners are Julian C. McIntosh, Detroit attorney, and J. A. McIntosh, president, McIntosh Stamping Corp.

Describes New Uses For Lithium

New uses for compounds of lithium, lightest of all solid elements, were described recently by Dr. Hans Osborg, vice president and general manager, the Lithaloys Corp., New York, at a joint meeting of the American Institute of the City of New York and the American Society of Mechanical Engineers. In the metallurgical field lithium has been used as a super-refining agent and as an alloying constituent in low-melting alloys.

Although principal applications have been in the nonferrous field, Dr. Osborg reported that development work has progressed to an industrial scale in applying lithium to cast iron and carbon and alloy steel. Micro-structure of lithium-treated cast iron, he demonstrated, shows more uniform distribution of free graphite, as well as a more uniform carbide matrix than untreated iron from the same heat. Lithium chloride and lithium fluoride also are important constituents of a flux used in melting magnesium alloy for castings.

Foundry Show To Be Largest in History

(*Concluded from page* 96)

permanent molds, and on dimensional stability of aluminum castings. Paper subjects include: "Heat Treatment of Aluminum Alloy Castings," "Interrelation of Factors Determining the Amount of Microporosity in Magnesium Alloy Castings," "Effect of Certain Elements on Aluminum Sand Castings," "Effect of Mold Materials on Quality of Magnesium Castings," and "Centrifugal Casting of a Magnesium Part."

Brass and bronze subjects include: "Use of Insulating Pads and Riser Sleeves for Producing Sound Bronze Castings," "Observations on Gas Elimination in Nonferrous Alloy Castings," "Magnesium Bronze" (the exchange paper from the Australian Foundrymen's Institute), and "Knockoff Risers for Nonferrous Castings."

The annual dinner, to be held Friday evening, May 10, will have as its principal speaker C. F. Kettering, president and general manager, General Motors Research Corp.

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BIRMINGHAM CONFERENCE

Covers Wide Range of Topics

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

FEATURED by an attendance of nearly 500, the fourteenth Annual Foundry Practice Conference sponsored by the Birmingham Chapter of the American Foundrymen's Association marked the first large-scale, postwar gathering of foundrymen in that district. The conference was held at the Tutwiler Hotel, Birmingham, on Feb. 14, 15 and 16, and comprised 5 technical sessions, a luncheon, entertainment program, a banquet and plant visitations. At the luncheon held Feb. 14 with Thomas H. Benners Jr., T. H. Benners & Co., presiding, the Hon. W. Cooper Green, president, Birmingham City Commission, welcomed the group.

Fred J. Walls, International Nickel Co., Detroit, and president of the AFA, stated the association now has over 8000 members, 33 chapters, and a budget of $341,800, the largest in history. Many new committees have been formed to devote closer attention to specific phases, and in particular Mr. Walls called attention to the Youth Encouragement Committee which is concerned with bringing young men into the foundry. He said that those in the industry should persuade their own sons as well as their friends' and neighbors' sons to enter the industry, since it offers an excellent future. That evening the group was entertained with a floor show and a showing of a motion picture film of the Alabama-Southern California Rose Bowl football game, arranged by Charles P. Saunders, Woodward Iron Co, and chairman of the entertainment committee.

The annual banquet was held on the evening of Feb. 15 with J. A. Woody, American Cast Iron Pipe Co., and chairman of the Birmingham Chapter, presiding. L. N. Shannon, Stockham Pipe Fittings Co., was toastmaster and introduced Milton H. Fies, Birmingham, who spoke on "Some Aspects of Research in the South." He pointed out that while the South is rich as far as good agricultural land was concerned, and was an excellent iron ore field, it is relatively poor since neither has been fully developed. Such development calls for research in agriculture and its by-products, metallurgy and industry. Mr. Fies stated that only 2 per cent of research is conducted in the South. However, he said that an excellent start has been made with formation of the Southern Research Institute, Birmingham. Research work also is being conducted in various universities and colleges in the South, and in time all of it will be of immense industrial benefit.

First technical session was held Thursday morning, Feb. 14, under the direction of John F. Wakeland, Alabama Foundry Co. Fred L. Overstreet, Illinois Clay Products Co., Chicago, spoke on "Sand Properties and Their Relation to Castings Defects." Mr. Overstreet pointed out that the ferrous foundry industry produces castings to the value of nearly $1 ¾ billion yearly, and that approximately 5 per cent of that is scrapped, due to some defect or other—a loss of $86 million. While sand is not the cause of all casting losses, it is one of the contributory factors. Close control of sand conditions will aid in decreasing such losses.

In addition to adjustment of moisture, bond, sand grain size, permeability, green, dry and hot strength to obtain the best results, attention should be given to control of ramming and use of seacoal. Mr. Overstreet mentioned a case where high scrap loss was encountered through variation in air pressure on the molding machines used in production of automobile manifolds. With an air pressure of 80 to 90 psi good results were obtained, but when the pressure increased to 115 psi numerous blows were encountered.

Seacoal with too much fines causes trouble due to decrease in permeability and increase in green and dry compressive strength. Just sufficient seacoal should be added to obtain the desired surface smoothness. It will burn out, leaving room for the sand grains to expand without disrupting the mold surface. Too much seacoal results in only a partial burnout, with the remaining semi-coked

(*Continued on page* 134)

Annual banquet during the Regional Conference of the Birmingham District Chapter attracted 425 members and guests

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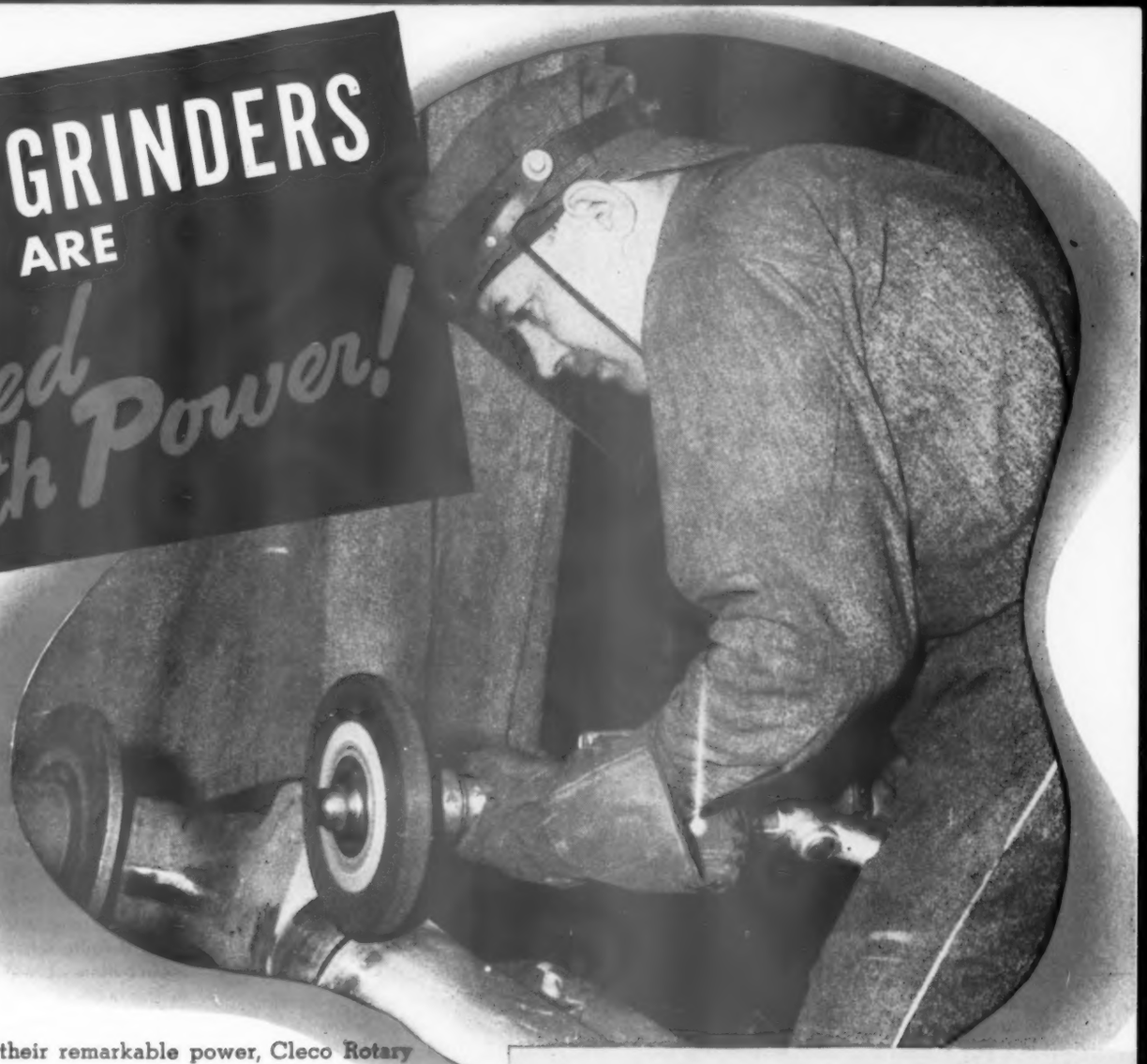

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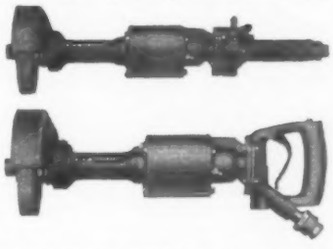
No. 860 Models illustrated—all series available with these straight or spade handles.



Typical straight and cup wheels, vitrified or elastic bond, used with our grinders. Be sure to consult the wheel maker for proper grit and grade. Tell him about the material to be ground, wheel speeds, diameter, face, and size hole, etc.

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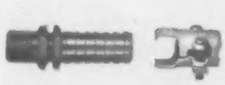

"Neverslip" Hose Clamp has "fingers" to hook into groove of **Cleco Hose Nipples.** The latter are "Clevetrated" to resist rust.

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CHAPTER OFFICERS: Officers and committee chairmen of the Birmingham District Chapter. Seated left to right: Fred K. Brown, secretary-treasurer; J. Arthur Woody, chairman; T. H. Benners Jr., vice chairman; James A. Bowers Jr., conference program chairman. Standing left to right: J. Pat McClendon, publicity chairman; Charles K. Saunders, entertainment committee chairman; John F. Wakeland, plant visitation committee chairman

(*Continued from page* 132)

coal bonding the sand into a stiff, rigid mold face which causes scabs and buckles. In reply to a question on parting materials, Mr. Overstreet said that an excess should be discouraged. It also was pointed out that seacoal high in sulphur requires use of a greater quantity than when it is low in sulphur. In mixing seacoal with sand the speaker advocated dry or semidry mixing for several minutes followed by addition of moisture and further mixing for 3 or 4 minutes. Better results are obtained if mixing is done in the morning, and the sand allowed to stand until afternoon before use.

The second technical session was devoted to a discussion of the history and development of the foundry industry, by Bruce L. Simpson, National Engineering Co., Chicago. L. N. Shannon, Stockham Pipe Fittings Co., Birmingham, was chairman of the meeting. Mr. Simpson stated that with the exception of agriculture, founding is one of the oldest industries. Around 8000 B. C. metals were discovered and worked in the cold state to the finished form. In 5000 B. C. copper was discovered in the Carpathian mountains. Weapons formed of copper by the peoples in that district gave them superiority over those in the surrounding country, and before long they swept down and conquered Mesopotamia.

In 3200 B. C. the first known copper castings were produced in that country, and the art of casting was carried into Egypt and China by traveling metallurgists. Iron was discovered about 700 B. C. and presumably the Chinese developed the cupola with a box bellows for the air supply then or shortly after. Cast steel first was produced in India about 700 A. D. Mr. Simpson mentioned that the ancient Egyptians were the first to use the lost wax process which later was employed by Benvenuto Cellini to make his famous statues. Coming down to more modern times he stated that the first gray iron casting made in America was produced by the Saugus Iron Works, Lynn, Mass., in 1642. One of the oldest foundries in this country is the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., which began as the Union Iron Works.

Variables in the coreroom was the topic of the third session, with Col. John E. Getzen, H. G. Mouat Associates, as chairman, and L. P. Robinson, Werner G. Smith Co., Cleveland, the speaker. Mr. Robinson stated there is a proper sand for every core, and while the ideal sand may not be available, superior sands may be found in each locality which are not prohibitive in cost. Binder for the sand should be selected to perform specific purposes if the most satisfactory results are desired. Ratio of binder to sand must be determined by experiment, and once established it should be maintained accurately unless results indicate a change is required.

Follow a Definite Schedule

Preferably dry sand should be the base and cereal added, followed by the oil. Moisture is added last. A definite time for mixing or mulling should be set up since uniformity of mix and optimum strengths are obtained by following a definite schedule. Moisture control is important because poor workability in the corebox, slow drying and cracked cores may result with high moisture. Baking temperature and length of time at that temperature mean the difference between good and poor cores. Usually if the core is baked at 400 F until the surface is nut-brown in color, it will be baked properly. If the core requires venting, see that the vent is not plugged through carelessness—and see that the vent from the core has a free passage through the mold. Last, but not least, provide a good inspection department to see that only good cores are sent into the foundry.

Fourth technical session had W. E. Jones, Stockham Pipe Fittings Co., presiding, and Tom E. Barlow, Battelle Memorial Institute, Columbus, O., as the speaker. Mr. Barlow discussed some of the "Do's and Don'ts of Inoculation" and stated that the difference between alloying and inoculation is that the agents employed in the latter may not show up in chemical analysis, but do make a change in the structure. Gray irons of similar analyses do not necessarily give concordant results in properties, but by use of various inoculating agents it is possible to keep the variations within a narrow zone. Inoculated gray irons do not have any better properties than the best uninoculated irons, but they show more consistent properties.

(*Concluded on page* 137)

J. Arthur Woody (left), Birmingham District Chapter Chairman, and general superintendent, American Cast Iron Pipe Co., at Regional Conference with Fred J. Walls, International Nickel Co., Detroit, and national president of the AFA

Pouring . . .

FASTER, EASIER WITH CLEVELAND TRAMRAIL

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Cleveland Tramrail equipment permits taking the ladle over the shortest route from cupola to mold without hindrance from floor obstacles. The metal is delivered with minimum heat loss.

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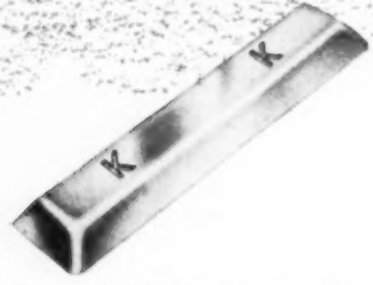
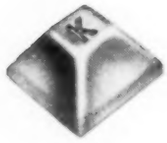
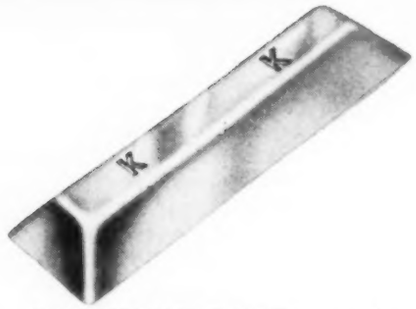


30-lb. pigs for charging the cupola.



12½-lb. piglets for foundries so uniform in weight that they may be *charged by count.*



60-lb. pigs for blocking in the open hearth.

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(*Concluded from page* 134)

Inoculation permits versatility in application of a single base iron within a reasonable range. That is, the strength of the castings may be varied to some degree, the hardness to some extent, etc., to meet certain requirements. However, the essential application of inoculation is to provide uniformity of properties in heat after heat. Two types of inoculants are available, one being graphitizing and the other carbide stabilizing. In the use of inoculants consideration must be given not only to the carbon and silicon content of the iron, but also to the cooling rate of the casting.

Structural changes obtained in the casting—and not in the test bar—is the criterion to follow, since the cooling rates may be entirely different. After the inoculant is added the iron should be poured, because the effect wears off in some cases as quickly as 4 minutes. While the chill test or wedge bar is a good means to control amount of inoculant required, it should not be relied upon entirely unless results on castings have been correlated. Cases have been noted where insufficient amount of inoculant gave satisfactory indication on one chill bar, but not on another poured within a few minutes. However, inoculation should not be used indiscriminately. Excess inoculant or over inoculation may lead to trouble such as pinholes and a hydrogen shrink showing a bright silvery appearance with whiskers.

Enthusiasm Is Necessary

Fifth and concluding session was held Friday, with James A. Downey Jr., Sloss Sheffield Steel & Iron Co. as the speaker and Dan B. Dimick, Dimick Casting Co., as chairman. Mr. Downey spoke on safety in the foundry, and said that safety usually is based on engineering, education and enforcement. While these elements cover certain fundamentals, they fail to function without the fourth E—enthusiasm. For example, engineering sometimes fails to cover all phases of safety; education can teach without the learner knowing he is being taught, while enforcement may indicate a bill of goods not thoroughly sold.

With enthusiasm as one of the factors, observance and practice of safety regulations are easily maintained. Necessarily, the enthusiasm for safety must begin with top management, since its attitude is reflected by the rank and file of workers. Proper attention to details can reduce accidents, but it must not be haphazard depending upon a campaign or two to carry it along. Action must be continuous day in and day out. A safety committee cannot substitute for management's lack of interest in safety.

Mr. Downey stated that, in his opinion, the best accident report is one that shows no accidents. All workers should be instructed carefully in their jobs, and any hazards pointed out so that they may be properly on guard. A foreman properly sold on safety imparts his enthusiasm to his men, and a good safety record usually is maintained. One good way to determine the efficacy of the plant safety program is to study the severity and frequency rates of accidents of other plants and the industry and compare them with your own records.

THE GERMAN STEEL CASTING INDUSTRY

(*Continued from page* 95)

made as castings.

Castings were produced to two types of test requirements: Class A, a full-load test and hardness tests; and Class B, brinell hardness tests only. Mechanical property requirements for aircraft castings were: tensile strength 130,000 psi minimum, and elongation 20 per cent minimum. Impact testing was not specified, but tests were nearly always made for information purposes.

Size of the test coupons was from ¾ to 2½ in. thick, depending upon the thickness of the critical section of the casting. Coupons were cast attached to the casting or separately. These requirements were being used for specification castings of all types, and not aircraft castings alone. No allowance for lower mechanical properties was made for the heavier sections.

Manganese - vanadium or chromium-vanadium steels were used in most cases during the latter part of the war. The castings were 100 per cent machined or ground. All castings were quenched and tempered and after heat treating, the castings were tested for hardness. This operation was followed by an oil cooking test (immersion in boiling oil for 1½ hours), followed by sand blasting and visual examination for oil leaks. All castings were magnetic particle tested and one in each lot was tested by radiography. The size of the specified lot depended upon the importance of the casting. A lot smaller than 30 was not observed from records.

Approximately 7 tons of molten steel were required to produce one ton of finished machine aircraft castings. All the steel foundries in Germany had fairly extensive machine shops and, for the most part, castings were sold in the rough or finished machined condition. One steel foundry employed 300 men in the cleaning room and in machining 100 tons per month of aircraft castings.

A foundry that developed the production of a design would be asked by the Air Ministry to supply identical pattern equipment and teach the personnel of other foundries in the production control of the casting. The foundry then

COREMAKING: Lynchburg Foundry Co., Lynchburg, Va., recently completed a second-floor addition to its coremaking facilities and the installation of a continuous drying vertical core oven. Shown here is the new second-floor coreroom with continuous belt conveyor, full of various cores, proceeding to the oven in the center background. Finished cores when dried are removed from the oven at first-floor level. Peak drying capacity of the oven is 6000 lb. of cores per hour

acted as a sub-inspector of this casting as made by other foundries.

There were no records of steel casting failures in aircraft. In 1943 the German government issued instructions that at least 2 per cent by weight of all steel construction in aircraft must be steel castings.

Armor Castings—Approximately 4000 tons per month of armor castings were produced in the various German steel foundries. Four companies alone, Bochumer Verein, Ruhrstahl, and Reichswerke Herman Goering, Linz and Krupp produced 2900 tons of finished castings per month. Most of the production was armor castings for tanks and gun emplacements or pill boxes. Some armor castings for ships, especially submarine deck covers, were produced. During the period (1942-43) of the preparation of the fortifications of the West wall, Bochumer Verein and Krupp produced approximately 1800 tons per month of cupola armor castings for forts. These castings averaged from 150 to 230 tons, casting weight. The popular composition for armor castings was 2.50 to 3.25 per cent Cr, 0.25 to 0.50 per cent Mo and 0.10 to 0.25 V. This was altered near the end of the war by dropping out the molybdenum owing to its scarcity.

Most castings were normalized at 1700 to 1825 F and then oil quenched from 1600 to 1650 F, followed by tempering from 1050 to 1250 F. Tensile strengths from 100,000 to 150,000 psi were obtained.

While track shoes for tanks were not usually considered as armor casting (from the standpoint of production figures), they were made in large quantities by a number of steel foundries. These castings, (Figs. 8 and 9), were produced in air dried sand molds with extensive coring. Sands used were either a fine, washed quartz sand with 3 to 4 per cent clay and one per cent dextrine (from potatoes) or a fine, natural-bonded sand of about 12 per cent clay to which dextrine was added. Mounted metal patterns with two or three shoes in each flask were used. All cores were made on core blowing and stock core machines, and were checked after baking to tolerance gages. Cores and molds were produced to very close tolerances so that there would be but little machining. Yield was approximately 80 per cent. The foundries did the required machining and assembled them in lengths of about 20 ft.

Prior to the war track shoes were produced out of 12 to 14 per cent manganese steel, but as the war progressed the composition was changed from one low-alloy steel to another in order to conserve alloys until, at the end of 1944, many track shoes were being produced from a 0.40 to 0.50 per cent carbon steel. The castings were given a water quench and temper heat treatment. Average scrap losses for all items including outside tolerances, machining and casting defectives, amounted to about 15 per cent.

Projectiles—Several thousand tons of steel per month went into the production of projectiles of the howitzer and mortar type, of 90 to 150-mm size. Steel for these projectiles was produced in acid-lined converters to a carbon content of 0.35 to 0.45 per cent. Phosphorus and sulphur content were specified not to exceed 0.25 per cent total. Phosphorus content normally was about 0.10 per cent and the sulphur 0.12 per cent. The projectiles were used in the as-cast condition, or were given an annealing treatment to obtain maximum machinability.

Made in Iron Molds

During early days of the war the process of casting projectiles was worked out and production in large quantities was started. The projectiles were made in cast iron molds so constructed that four to six projectiles were cast in the same mold. Nose of the projectile was not cast as an integral part of the shell. An oil sand core, thickly washed, was inserted to fit tightly at the nose of the projectile and to stand upright. Base of the projectile was uppermost in the mold and was stopped off at the proper height by a cover core. The cover core contained eight pencil gates of ½-in. diameter, equally spaced around the circumference of the projectile. Steel was poured into a centrally placed runner cup which distributed the steel to the four or six openings. From there the metal fed through the pencil gates to each projectile. Risers were not used to feed the castings. The metal mold and the sand core permitted excellent controlled solidification. The projectile section was approximately 1⅜ in.

The cores were about 2 ft long and were made on core blowers. Approximately 600 shell cores were made by two women operators in 9 hours. Surface appearance of the shells was not too good, but this made little difference as they were required to be machined on the outside surface. An allowance of about ⅛ in. was made for machining but the inside surface was not machined. The cast iron molds produced from 3500 to 4000 shells and were then machined out to produce a larger projectile.

The minimum properties required for shell steel were: tensile strength 85,000 psi and elongation 3 per cent. A fragmentation test required a minimum of 420 fragments over 5 grams per shell. Shells were given a hydrostatic test at 10,000 lb pressure. Weight of the as-cast shells was from 30 to 40 lb, depend-

(*Continued on page* 140)

CAST BOMB: Huge bombs dropped by the English during the latter part of the war sometimes failed to explode properly. This one's nose fuze did not go off, exploding only through the tail fuze and leaving part of the shell intact. Most of these 10 and 12-ton bombs were cast in Sheffield by the English Steel Corp. A description of the casting method was presented in *THE FOUNDRY* for September, 1945. (Photo courtesy M. T. Ganzauge, General Railway Signal Co., Rochester, N. Y.)

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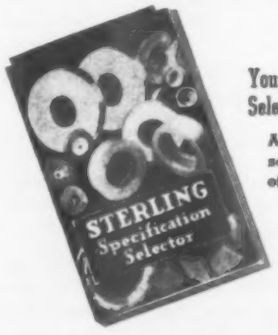

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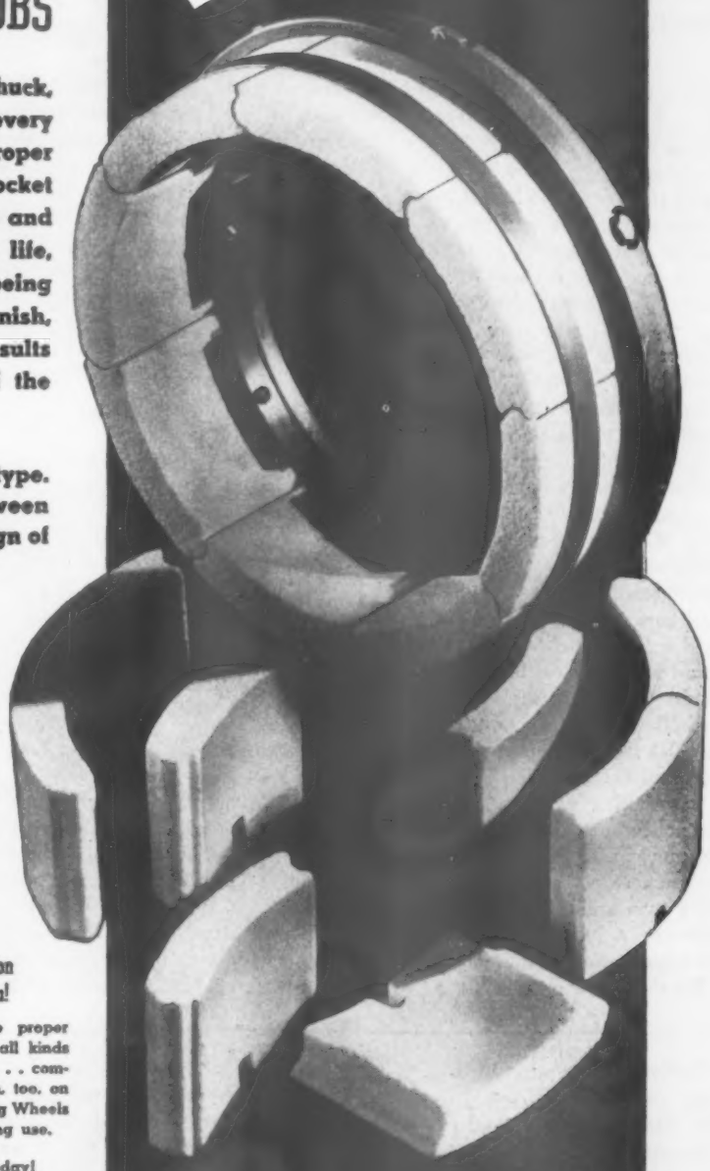

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MAN-TO-MAN on the Molder's Bench

"Credit Where Credit Is Due"

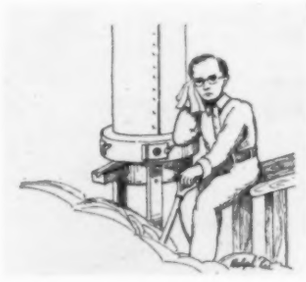
By RALPH L. LEE

I NEVER get much of a bang out of the hand shoveling I have to do to get my sand pile in shape. Perhaps it's the satisfaction from licking a tough molding problem and the credit for having done it that keeps me panting and sweating. So it must be that pride of accomplishment and personal standing are the alloys which convert hard labor into satisfying work.

When, after many failures, I do get a good casting up there in my little foundry, I always, no matter what time of day or night, tote it down to the house and show it to Mother (that's my better half). While molding is pretty much Greek to her, she always manages a few "Ohs!" and "Ahs!" of appreciation which seem to make my backache, sweat and previous failures well worthwhile.

Knowing how much I dote on having Mother and a few understanding pals to whom I can show my castings, I sometimes wonder whether the folks we lean on for the bulk of our production couldn't use quite a bit more of this labor-sweetening appreciation themselves. I wouldn't be a bit surprised if we found the lack of it might not be at the very core of labor friction, turnover and shortage.

No one can ever make me believe that the foundry owners and bosses I meet on my travels are a hard-hearted lot and lacking in appreciation of the good work their people do. But I must say some of them, at least, have one heck of a time trying to find time and the opportunity to get it over to their people. In fact, I can't figure out how even the most appreciative could ever get the idea over in competition with the unearthly racket from jolt-squeeze machines, vibrators, tumblers, air hammers, presses, blasts and gasoline trucks. Under these conditions, I can see how a boss would go



clear around the block rather than even try to start a conversation.

After having gone through one of these boiler-factory foundries and having given up all hope of even trying to hear what my guide had been shouting into my ear, I asked him in the front office whether the foremen had any place to go or the chance to talk to their employees about their work or personal matters. He told me that while he certainly saw the need for it, he had to admit they weren't very well off in this respect.

I don't know what it would cost for each foreman to have a spot where he could carry on a fairly normal conversation in private with each of his boys or what it would do to the production schedule and the bookkeeping if each foreman could clear his desk for a personal chat with each of his employees once a week at least. But I do know this—that punching the old clock, in the presence of a guard, day after day as one of a long line, taking up the day's work without a "Howdy" from the boss, working all day long without so much as a "How'ya comin'?" and then lining up at the end of the day to punch out without a boss' "Be seein' ya," this routine is plain unadulterated labor of the most thankless sort no matter how high the pay, how clean the plant or how gruntless the work. In fact, to my way of thinking, it can be nothing more or less than serving a sentence at hard labor to eat.

I'm beginning to see now why some molders stick to their jobs for years in spite of dingy plants—plants that are too cold in the winter and too hot in the summer, with too much shoveling, ramming and heavy lifting, but where they are known, greeted and treated as though they were somebody, somebody worth knowing regardless of their jobs, where they can see the good or the bad they have done and where they are never, u n d e r any circumstances, taken for granted, neglected or ignored.

I am convinced that when we recognize personal attention, recognition and honest appreciation as the principal difference between serving a stretch at hard labor and constructive and worthwhile work we will provide these ingredients at any cost. And once the benefits in terms of increased production are measured against the cost we would no more think of operating our foundries without them than we would without sand, fuel, metal, flasks and patterns.

(*Continued from page* 138)

ing upon size. One steel foundry, Deutsche Eisenwerke, Mulheim, produced approximately 35,000 projectiles a month. Several others cast over 20,000 projectiles per month.

Artillery officers of the U. S. Army, who had come up through Italy, stated that the cast steel shells were effective and compared favorably with forged shells of the howitzer type.

Gating and Feeding — Considerable use was made of top gating by German steel foundrymen. A gating arrangement similar to that shown in Fig. 2 was commonly used and was well liked. Considerable use was also made of the open side down-gate, which may be more properly described as a continuous step-gate. Whenever metal streams impinged upon mold or cores, it was the practice to use chamotte inserts regardless of the mold composition.

All of the better foundries practiced controlled directional solidification and made careful studies of feeding action according to the principles of inscribed circles, as established by A. Heuvers of Bochumer Verein. Most of the foundries had a committee to plan the location of gates and risers.

For large risers over 15 in., portable electric arc equipment was used in most foundries. The equipment consisted of one, two, or three electrodes, depending upon the size of the riser to be heated. Electrodes were about 3 to 4 in. in diameter, and the arc was struck as soon as the riser was filled. Risers were generally massive and tall, much more so than those employed in the steel foundries in the United States. If risers were employed the yield was seldom over 50 per cent and in some cases was as low as 35 per cent.

Molding and Coremaking — Molding and coremaking departments in German steel foundries were not mechanized. Only in two foundries, the automotive foundry at Krupp and the Herman Gor-

(*Continued on page* 144)

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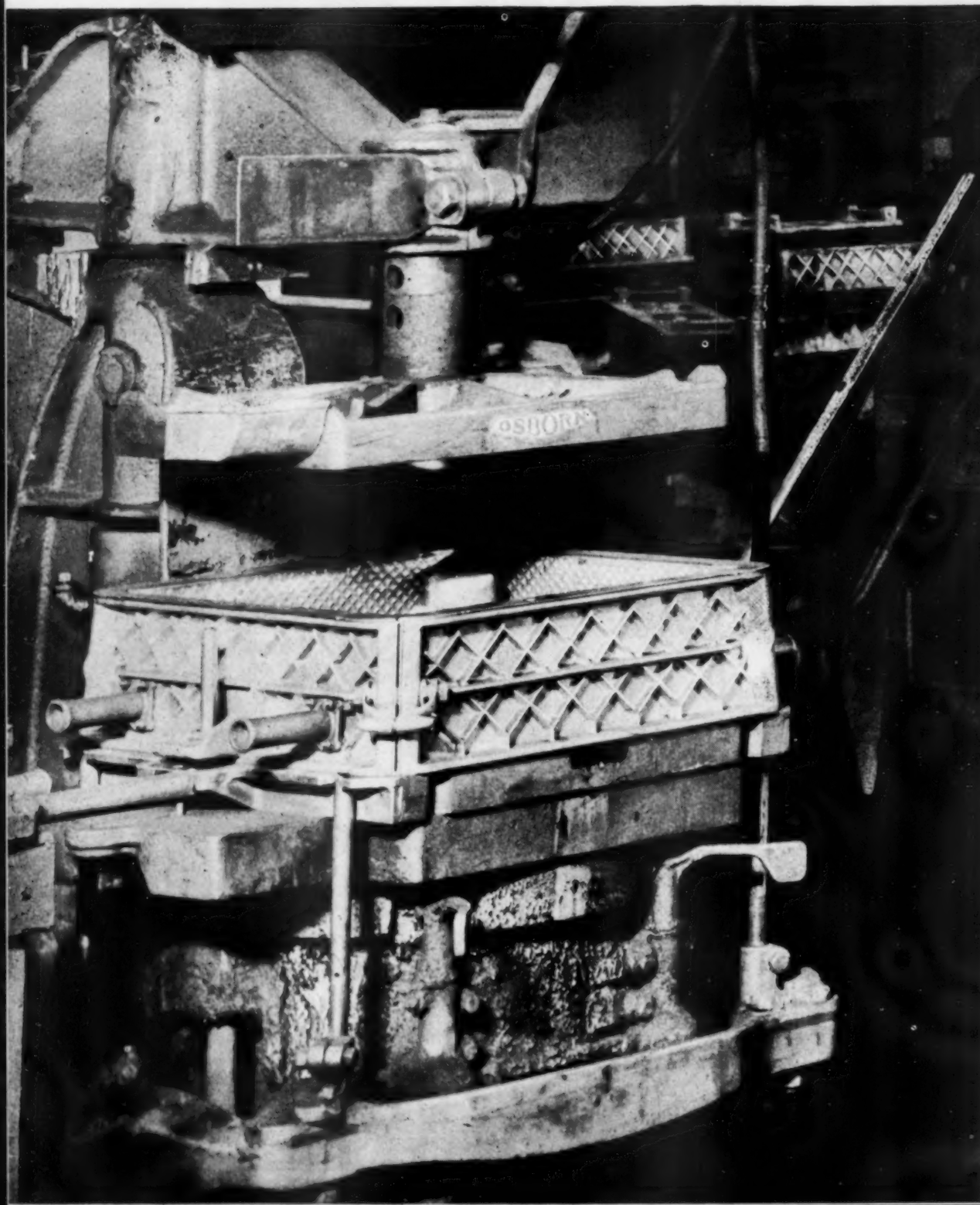

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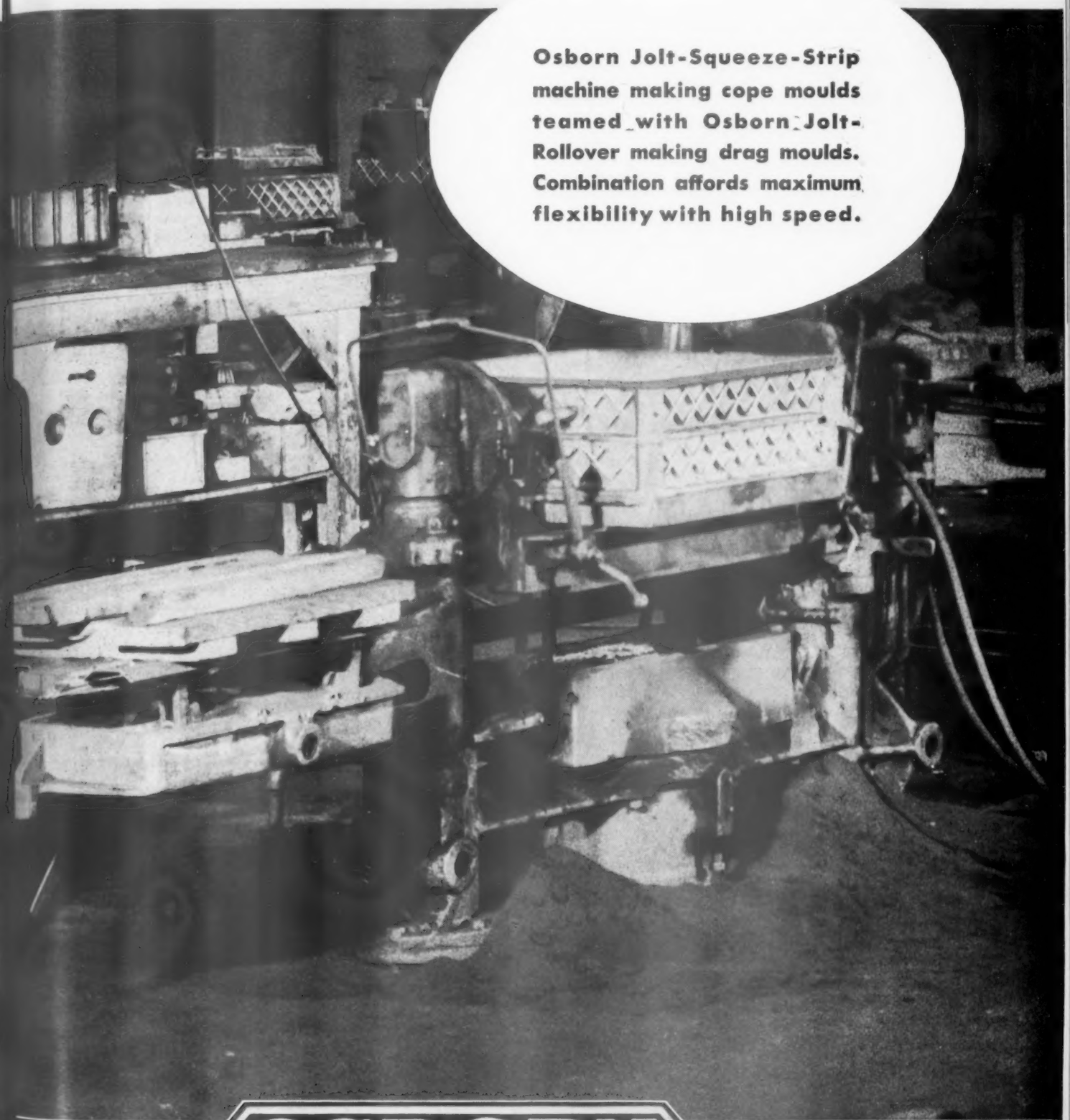


Osborn Jolt-Squeeze-Strip machine making cope moulds teamed with Osborn Jolt-Rollover making drag moulds. Combination affords maximum flexibility with high speed.

OSBORN

MOULDING MACHINES

MEMBER MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

(*Continued from page* 140)

ing Works at Linz, was there any semblance of the average American foundry. The reason for this condition was apparently that labor rates were so low compared with capital expenditures for machinery and interest charges, that it was unprofitable to install labor-saving equipment.

Only one foundry had a modern sand-distribution system. Molding materials were not reclaimed even by a simple process of sand cascading. In fact, there were no manufacturers of sand reclaiming equipment in Germany. Mullers and jolt-ramming machines were similar to our standard equipment. Roller conveyors were few and monorail-handling equipment was never seen outside of the cleaning room.

All large castings were produced in chamotte except for a few made in cement-bonded sands. Chamotte is a high-alumina-content clay that is calcined at high temperatures and then pulverized and graded. A small percentage of the raw clay is mixed with the calcined clay as a bond.

The Germans normally produced considerable tonnage of steel castings in chamotte, supplies of which were adequate for the production required. The small and thin-sectioned castings were normally molded in a Belgian natural-bonded sand. This sand became unavailable for foundry use rather early in the war, owing entirely to lack of adequate transportation facilities. Foundries then proceeded to use local natural-bonded sands, and in several cases a silica sand bonded with cement was used.

The quality of sand varied considerably because of lack of proper mining operations, and this condition required the constant variation of sand mixes. The primary difficulty was in the procuring of bonding materials such as a substitute for bentonite, and proper organic binders such as cereals and oils. As the war continued the cereal binders deteriorated in quality. Usually, a dextrine produced from potatoes was used but toward the end of the war potatoes could not be allotted for dextrine production.

Chamotte is a very open molding material, and an impermeable face is obtained by applying a thick coating of a mixture of graphite, finely ground chamotte and water. Surface appearance of the castings so produced is good, providing the facing sand is new chamotte. Most foundries do not use the chamotte as purchased, but mix it with various proportions of used chamotte or a mixture of chamotte and sand. The mixtures, known as "form masse," become quite dense, depending upon the amount of sand added, and do not produce castings of a very good surface appearance. In fact, most of the castings, prior to machining, could not be sold in this country as the surface appearance was so poor.

Chamotte molds were oven dried at temperatures approaching 1000 F. The molds were fairly resistant to metal erosion and broke down fairly readily under heat. Because of the open character of the molding material, the transference of heat is rapid. Considerable care was given to the use of collapsible materials in the backing sand of all molding materials. Use was made of hay rope, ashes, cinders, sawdust, etc. Metal-relieving blocks were also used on large castings.

Sands used for steel molding were mostly natural-bonded sands, although some synthetic-bonded sands were used. These sands were generally quite fine with average grain size classification between AFA Nos. 75 and 100. The natural-bonded sands were very gummy, since the bond content was normally between 12 and 15 per cent. Moisture content was not closely controlled, and for those sands that were to be dried no attempt was made to control the percentage of water addition.

Green sand practice in Germany was an air dried one in that molds were permitted to air dry from 12 to 24 hours prior to pouring. Air drying produces a very hard mold.

Sand Is Not Reclaimed

Cement sand molding was used only at the foundries of the Ruhrstahl A. G. A washed silica sand, cement, alkylin and water constituted the molding mixture. "Alkylin" was the name given to a water-soluble cellulose-ether solution. The molding practice was similar to that used in this country, except that the sands were not reclaimed to any great extent.

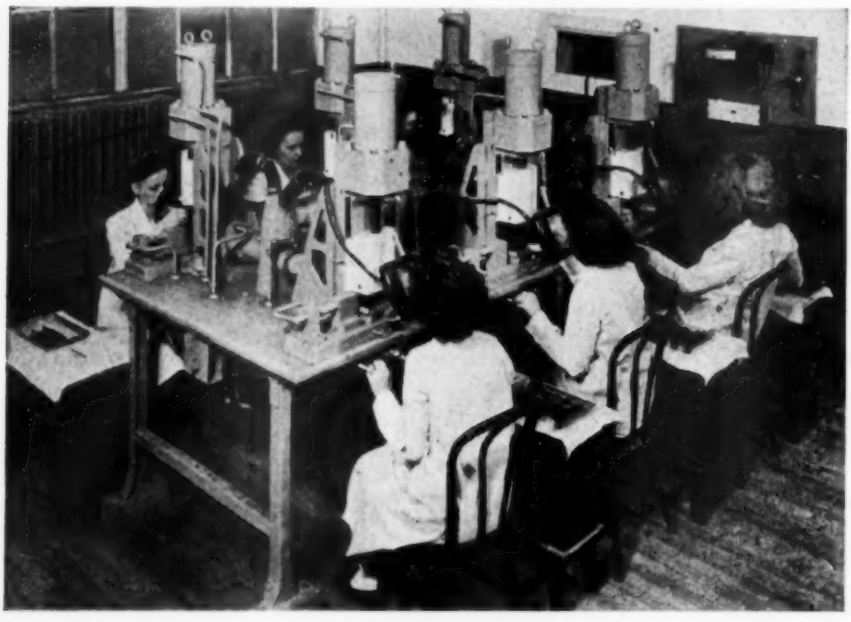
Most molds were prepared on jolt machines. A number of foundries had large jolt roll-over machines which could handle 5 to 10-ton molds. The practice of assembling large molds out of cores was not used. Molds were produced in pit forms, with chamotte as the molding material.

Conveyors or hand cranes for removing mold from molding machines were few. The normal practice was to carry molds to the pouring floor or to have large overhead cranes pick up molds too heavy for two men to carry. All small molds containing 50 lb or less of steel were poured off by the molders and their helpers.

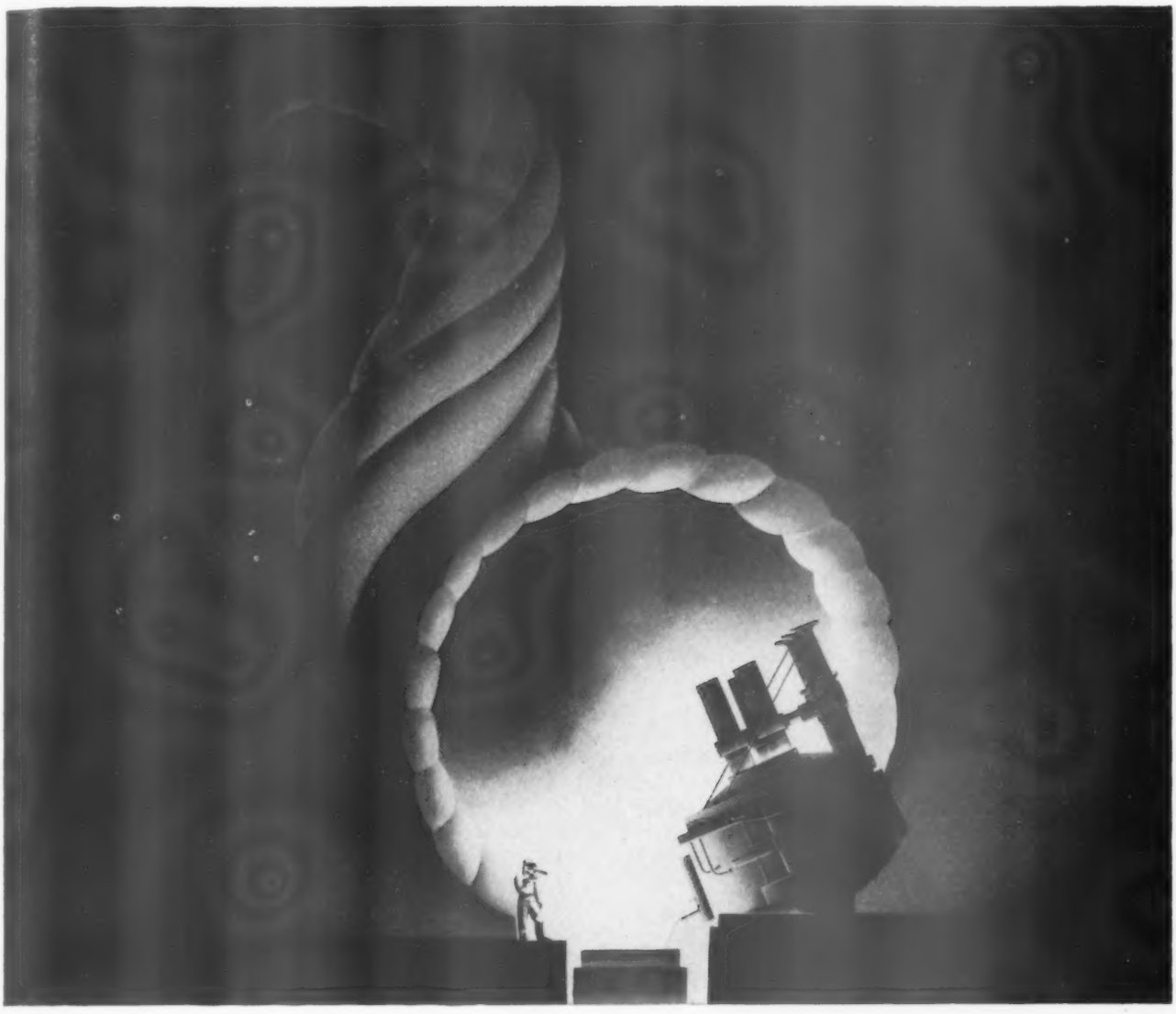
Corerooms generally were not modern except for the one outstanding feature of core blowing. Cores were produced from oil sands, natural-bonded sands plus dextrine, cement sands and chamotte—depending upon the type of casting to be made. Cores for most large molds were made out of chamotte of "form masse." Only very important cores, such as cores for the tank trucks, could be produced out of oil sand since oil of any type was a high priority commodity.

Cores which required a high degree of dimensional accuracy, such as for track

(*Concluded on page* 146)



PRECISION PATTERNS: This battery of six injection units, shown in operation at the Kerr Dental Mfg. Co., Detroit, produces wax patterns used by the company in making precision castings. The units are hydraulically powered and automatic in operation. Each one is capable of producing wax patterns at the rate of three per minute



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(*Concluded from page* 144)

shoes for tanks, projectiles, and aircraft castings, were all produced by core blowing. Nearly all the core blowing machines were produced by Vogel-Schemmann. Air pressure of these machines was 90 psi. The machines were massive in construction, and weighed from 1 to 2 tons. Cores weighing as much as 40 lb or in sizes such as 20 x 8 x 6 in. could be produced on the large machines. Every steel foundry visited contained one or more core blowing machines. In some cases, eight to ten core blowers were available. Even though there was an utter lack of mechanized equipment in the foundry, there was always a core blower.

Cores weighing from 20 to 30 lb could be produced in 5 minutes, which included the laying of core wires and removing the core from the machine. Sand capacity of such a machine was about 60 gal. An electric motor kept the sand in motion in the feed chamber.

In many cases the core box used in core blowing was lined with hard rubber. The box was made of aluminum; only the general contours of the core to be produced was formed. A die, the shape of the core, was made, and the hard rubber lining was pressed into the shape desired by the core.

Records indicated that a greater life could be obtained for a core box by using the rubber lining. If the lining did wear to the point requiring a change in the core box, the rubber lining was ripped out and a new lining inserted by the pattern supply company. Cores were produced to very close tolerances in the rubber-lined core boxes.

German foundries extensively used the Georg Fisher Co. sand testing apparatus. However, apparently no tests were going forward on the properties of sands at high temperatures with the exception of sinter tests.

Cleaning and Welding—Every foundry had from one to 20 large circular saws for cutting off gates and risers. The saws varied from 3 to 6 ft in diameter. The German foundryman realized that it was more costly and time-consuming to saw risers than to cut them by oxy-acetylene, but sawing was preferred since in many cases the smooth saw-cut area acted as reference points or positions for setting castings during machining.

Shot blasting was much preferred to sand blasting, and cleaning room equipment was extensive and modern; this was necessary, considering the large proportion of castings containing "burnt-on" sand. In most cases the cleaning room was separated from the foundry. Grinding booths were fairly well ventilated. Bakelite-bonded swing-frame grinding wheels were used and were well liked.

Electric arc and atomic hydrogen arc welding were used in all foundries. The atomic hydrogen arc method was preferred because it was claimed that results superior to electric arc welding could be obtained with unskilled foreign labor. Approximately 70 per cent of all welding in the industry consisted of atomic hydrogen welding. In some foundries all welding was done by the atomic hydrogen practice. It was universally used on all light weight castings.

Carbon steel castings were not preheated prior to welding unless the casting was large and an important one, or unless the carbon was above 0.50 per cent. All alloy steel castings were preheated from 200 to 900 F, depending upon the alloy content and the shape of the casting.

Most welding requirements were set by the foundry. Heat treating after welding usually consisted of heating the casting above the critical temperature. Only occasionally were welds given a stress relief heat treatment.

Welding Strictly Controlled

For the usual class of castings all defects could be welded with no limitations as to the depth or extent of the area to be repaired. All that was necessary was that a red mark indicating the position of the weld be placed on the casting surface. Even this requirement was not complied with at all times.

Welding requirements for certain railroad castings were high; defective areas to be repaired were required to be shown on a blue print and sent to a bureau in Berlin for approval to weld. For armor castings there was a restriction that an area ready for welding which extended to a depth greater than 15 per cent could not be welded. Also, defects on only the outside surface could be welded.

On large castings where the defect was extensive, the casting designer was required to observe the casting at the place where the defect had been removed, and calculate if the remaining wall section would give the proper design strengths without factors of safety. If so, the weld was made and the weld area considered a factor of safety. No welder-approval tests were made by the government or inspection agencies. The welders were approved by the foundry.

Four types of electrodes were used which would produce the following strengths after an annealing heat treatment: 54,000 to 64,000 psi, 71,000 to 78,000 psi, 128,000 to 142,000 psi, and austenite, oxyacetylene welding was used only in minor cases or for special purposes.

Heat Treating — Castings were heat treated mostly by annealing or by liquid quenching and tempering. Specification requirements were not exceedingly high as may be observed from Fig. 13, which lists the government steel casting specifications. Whenever possible, alloy steel castings were quenched and tempered. Water or oil quenching was used, depending upon the alloy compositions or the carbon content and the thickness of sections. The government specified oil quenching for all casting compositions containing nickel, and water quenching for alloy compositions without nickel. Castings of carbon contents above 0.50 required quenching in oil, castings weighing as much as 150 tons were water quenched and as much as 230 tons were oil .quenched. The mechanical equipment for quenching did not usually lend itself to fast quenches or to time quenching. Hardenability studies were not made to assist in quenching and tempering practices, and time quenching was not employed.

Inspection and Testing — Most castings, either small or large, had poor surfaces. In many cases metal penetration and pinhole porosity were very prominent. Sand, slag inclusions and buckles were also fairly extensive, and shrinkage cavities and hot tears were occasionally encountered in castings.

Very little use was made of radiography. The x-ray machines were small and radium was not used, but messotherium was supplied by the government inspection service for inspection of certain classes of castings. Magnetic particle testing was used on all aircraft castings and on a few armor castings.

Tensile properties of castings were excellent. A considerable amount of impact was carried on and, in some cases, notched-bar impact values were specified.

It is the opinion of the author that as a whole the quality of the steel castings produced in Germany was not equivalent to that produced in the United States.

Centrifugal Castings—The horizontal centrifugal castings of steel tubes and gun barrels in a water-cooled mold with a thin sand coating of 3 to 5 mm was a new practice. Use of air pressure for operating centrifugal machines for liners and cylinders likewise was new. The casting of guns in a vertical centrifugal casting machine was also not practiced in the United States. Centrifugal casting of molds on a turntable machine operated by a vertical spindle was used in Germany, but not extensively.

Editor's Note: For those interested in a more detailed analysis of German steel foundries, a 149-page report, "The German Steel Casting Industry," by Max T. Ganzauge and Charles W. Briggs, may be purchased through the Office of the Publication Board, Department of Commerce, Washington 25.

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Technical Discussions at WISCONSIN FOUNDRY CONFERENCE

By
EDWIN BREMER, PAT DWYER, E. F. ROSS
The Foundry
ALFRED W. GREGG
Whiting Corp., Harvey, Ill.

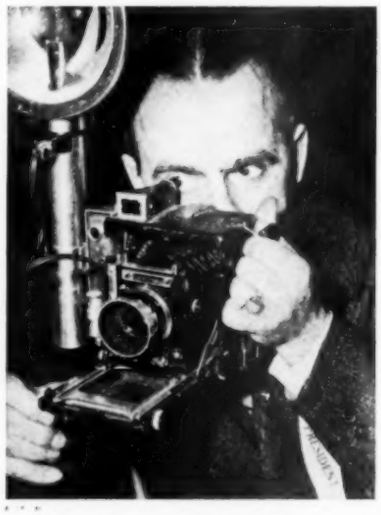
Concluding reports on technical papers presented at the ninth annual Regional Foundry Conference of Wisconsin Chapter, AFA, and University of Wisconsin are given here. Reports on the other conference sessions appeared in the March issue

CUPOLA operation was discussed by Ralph Clark, Electro Metallurgical Sales Corp. Co., at one of the sectional meetings, under the chairmanship of William Brooks, Allis-Chalmers Mfg. Co., Milwaukee, with Harold Sohner, International Harvester Co., Chicago, as co-chairman. A number of slides were employed to illustrate various features essential to the proper operation of a cupola, also to direct attention to basic principles and to the reason underlying unsatisfactory performance. He declared that attempts to force a cupola beyond normal capacity should be condemned.

A proper balance must be maintained between the weight of iron and coke and the volume of air introduced to promote combustion. Equipment is available to control and regulate this important feature, but even with the best equipment the human element is still an important factor. Charging the cupola should be entrusted only to an experienced and reliable man who keeps close watch on members of his crew and permits no deviation from established practice. The common saying that you get out exactly what you put in is rather misleading. Under varying conditions of operation the product of several charges may differ widely in composition and resulting chemical and physical properties.

Lively discussion, at times illuminated by flashes of wit, followed the presentation. For example, a member wanted to know how to increase the carbon content of an iron made from an all-scrap charge. Following reference to the use of carbon briquets and petroleum coke, a member suggested it might be a good idea to use a little pig iron.

Replying to an inquiry on the proper height of the charging door, the speaker stated that the door should be at least 21 ft. above the sand bottom, and about 26 ft. where the cupola is charged with a bucket. One of the main advantages of a high stack is that the descending charge gets the full benefit of the ascending hot gas. To the question of whether a 48-in. cupola could be operated continuously 48 hrs, the answer was yes, but the practice was not recommended. Reference was made to instances where water-cooled cupolas ran long heats up to 5 days; but special conditions were present in each instance. On the question of hot blast it was agreed that a temperature of 450 F is the most efficient. The chairman pointed out that constant care and supervision of the equipment was an important factor in securing benefit of the hot blast.



CHAPTER PRESIDENT

One photograph from Milwaukee that is NOT by courtesy of John Bing, A. P. Green Fire Brick Co.—it's of John himself. President of the Wisconsin Chapter this year, John for many years has recorded pictorially the activities of Wisconsin foundrymen. *(Milwaukee Journal photo)*

Following the session on cupola operation the gray iron group at a later meeting carried on an animated discussion on the causes of scrap castings. A series of slides showing various types of casting defects furnished text for comment by the three leaders—A. Lebesch, Allis-Chalmers Mfg. Co., F. Kulka, Motor Casting Co., and Paul Woehlke, Grede Foundries. The blemishes included cuts, scabs, drops, blows, shrinks, rat tails, dirty areas. In the majority of instances the sand was directly or indirectly responsible for the defect in the casting. If the sand was not too wet, too dry, rammed too hard, or not hard enough, the grain size and the bond either were too high or too low. Diagnosis of some cases presented no particular difficulty, but some instances presenting a complication of symptons led to extended discussion. Attention was directed to the difference between machine and hand-rammed molds and the necessity of adapting the sand to fit conditions. A mold made on a machine is not the same as a mold tramped and jumped off by a man skilled in that branch of foundry practice.

Should Spread Knowledge

At another gray iron session, W. A. Hambley, Allis-Chalmers Mfg. Co., Milwaukee, presented an exceptionally interesting and informative lecture under the title, "Metallurgy for Practical Foundrymen." The meeting was presided over by Harold Sohner, International Harvester Co., Chicago, and Kenneth Geist, Allis-Chalmers Mfg. Co. In his opening remarks the speaker stated that all he was going to say was well known to members of large foundry organizations, and therefore would have special appeal to men who for one reason or another had been denied the opportunity of studying the subject, or in practicing operations in which an intimate knowledge of metallurgy was actually essential. At present, he pointed out, and to a constantly increasing extent in the future, this form of knowledge is and will be essential to meet the demands of industry in which castings play such an important part. With one or two exceptions he deplored the lack of books devoted to the metallurgy of gray iron. This condition probably is due, at least in part to the attitude of foundrymen in refusing to share with each other what they consider secrets.

The first really important step in pur-

(*Continued on page* 150)

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(*Continued from page* 148)

suit of metallurgical knowledge followed Turners' discovery and development of the carbon-silicon principle. This was followed later by further investigation of the effect of the other elements, but the effect of silcon, manganese, phosphorus and sulphur was not actively investigated until about 1914. Good foundry practice is essential to reaping results of metallurgical knowledge.

Referring to control devices, test bars and chill tests, the speaker pointed out that time, temperature and thickness of section must be taken into consideration before drawing conclusions. Several slides were employed to show various iron compositions and illustrate the application of the carbon-equivalent principle.

Replying to a question from the floor the speaker stated that the popular conception of sulphur as a harmful ingredient is entirely wrong. Sulphur content up to 0.18 per cent has no harmful effect where the sulphur-manganese balance has been maintained approximately 4 to 1.

On the subject of inoculants and the production of high test iron, the speaker asserted that the most important factor is hot melting. A difference in melting temperatures will be reflected in the tensile strength and other physical properties of castings poured from the same composition.

Other features treated in considerable detail included change in graphite at temperature 2800 F or higher; results of cooling rates, chill and spiral tests, effect of sand in mold, freezing temperatures of irons of different composition and future optimistic vision of the foundry industry. This last feature depends on a realization that castings are needed for definite engineering purpose, and not merely to meet specifications of weight and space.

Replying to questions from the floor the speaker stated that metal held in the well of cupolas does not pick up carbon. Total carbon may be picked up in the melting zone. Some of the newer inoculants may be held for 30 minutes. Attempting to pour several mixtures from one cupola heat is possible, but the practice is not recommended. Division between charges, when melted, is not sharp and definite. A split charge of neutral metal is needed between charges of widely varying composition. Metal from the split charge is poured into a neutral type casting or into a pig bed.

"Practical Control for the Small Foundry" was explained by H. F. Scobie, American Foundrymen's Association, Chicago, at a succeeding gray iron session, where Frank Kulka, Motor Casting Co., and Anthony Lebesch, Allis-Chalmers Mfg. Co., served as chairman and co-chairman respectively. According to the author, successful gray iron foundry control presupposes a knowledge of the variables to be encountered, how they effect foundry operation and what can be done to hold these variables in check. Poor selection of melting stock seriously may effect the quality of a casting, mechanical properties, corrosive resistance, electrical properties, pressure tightness, resistance to galling, etc. Over 50 per cent of all defective castings are due to poor molds and cores. Apparatus for testing sand should be used daily.

Establish Accurate Values

Tests of various kinds cannot be considered separately. A change in one variable usually means a change in one or more others. Causes of difficulties in sand conditioning may not be recognized until accurate values are established. Core sand mixtures should be checked periodically for weight or volume of binder. Time, temperature and oven temperature are three important variables. Every core oven should have a temperature indicator.

Melting and metal control start with proper selection of raw materials properly weighed. Pressure gage on the cupola wind box and volume gage in the blast pipe provide valuable information. Some form of air weight control is necessary to coincide with atmosphere changes.

A running log should be kept of each heat to enable the foundryman later to predict uniform melting rate and to decide on several factors in connection with refractories and lining. A chill test supplies a ready means of judging composition. Temperature of the iron at the spout reflects conditions on the inside. A fluidity test is a fairly reliable indicator.

In a general way fluidity increases with carbon equivalent, and chill decreases. Color, texture and fluidity of cupola slag indicate inside conditions. Fluid,

(*Continued on page* 153)

Scenes at speakers' table during luncheon and dinner meetings of Wisconsin Foundry Conference. (Photos by John Bing, A. P. Green Fire Brick Co.)

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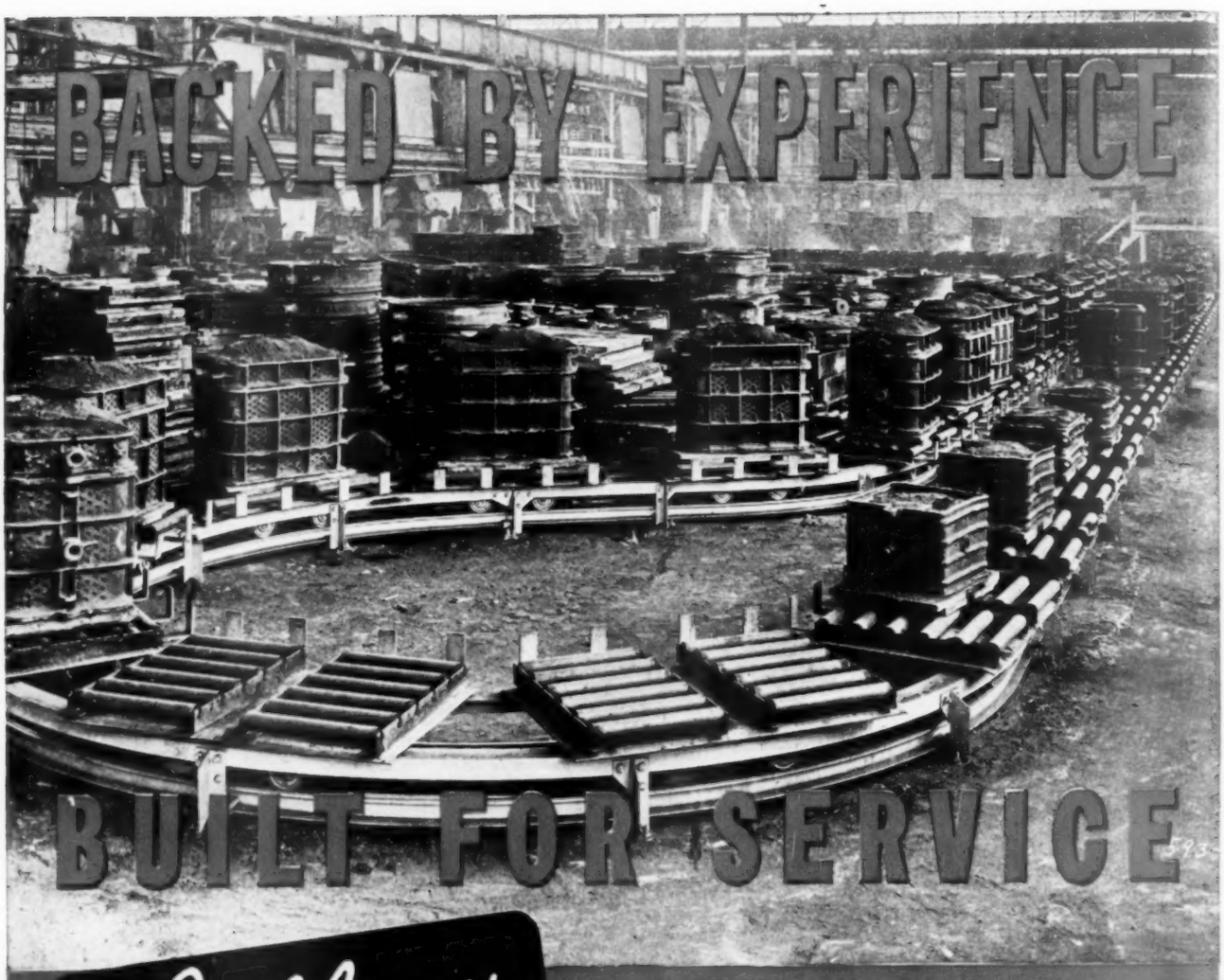

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(*Continued from page* 150)

green, glassy slag is good. Free running watery, brown or black slag contains iron oxide. Attacked lining is reflected in white, stony slag. High blast may produce a foaming slag.

Mechanical tests and analysis should be made regularly and recorded. The question of whether to operate one's own laboratory or depend on outside service is one of service, economics and experience. The major cost is in personnel. In a small foundry one man can do all the work and have time left over for other duties. Commercial laboratories usually offer consulting experience. In conclusion, 1.—Foundry control is necessary in modern foundry operation. 2.—Foundry control costs less in the long run than absence of foundry control. 3.—Foundry control may be simple or elaborate, but even the most simple techniques are valuable.

First of two malleable iron sessions dealt with annealing methods and equipment, with James H. Lansing, consulting engineer, Malleable Founders' Society, Cleveland, as the speaker. Chairman at both was Steve Pohl, Federal Malleable Co., West Allis, Wis.

Annealing Costs Vary

Mr. Lansing said the latest figures indicate that of the country's annealing capacity 27 per cent is continuous equipment, mostly gas-fired; 60 per cent is batch type, pulverized-coal-fired; 11 per cent is gas and electric batch type; and between 1 and 2 per cent is oil fired Comparing oven types and costs, he submitted average costs per ton as follows: Car-bottom muffle, $6.14 for a 3-day cycle and $6.64 for a 4-day cycle; car and alloy pot, $8.56; shell and hearth, $8.48; radiant periodic, $7.44; electric periodic, $9.50; and pulverized coal periodic, $7.31. The four costs involved in the compilation are depreciation per ton cast, pot or tube cost, fuel cost, and packing and dumping per ton.

Some additional annealing oven and pot statistics revealed the following cost increases between 1938, when a similar survey was made, and 1945: Average maintenance cost increase, 53 per cent; fuel cost increase, 31 per cent; packing and dumping labor increase, 32 per cent; cost per ton, $3.64; pot cost increase, 42 per cent; cost per ton, $3.10; pot life runs, 21; and average pot weights, 424 pounds.

Regardless of the specification of malleable iron being made, Mr. Lansing asserted, the objective is to utilize annealing in such a way as to get the best physical properties. To illustrate his point that ultimate strength, yield point and elongation can vary widely due to annealing, he displayed a chart of seven anneals all from one heat. The wide variations were striking. Although analysis is not complete as to why this should be so, evidence seems clear that the two principal factors are decarburization and the length of time of holding the metal at 1300 to 1350 F.

Discussion of the fact that wedge results do not always correspond to test bar results brought from Mr. Lansing the comment that good elongation does not always guarantee good impact. Further, to give a fair test of the metal, test bars always should be poured at a good average temperature. The latter point was confirmed by one discussor, who cited an experience to show that poor physicals resulted when bars were poured some distance from the furnace, but good physicals when poured at the furnace, the difference being the temperature of the metal.

At the final malleable session, under chairmanship of J. G. Kropka, Chain Belt Co., Milwaukee, the topic was "Du-

Other informal views at Wisconsin Foundry Conference. (Photos by John Bing)

plexing Malleable Iron." The subject was introduced by Frank Lepour, assistant melting supervisor, Belle City Malleable Iron Co., Racine, Wis., who described the duplexing practice in that plant, built during the war to afford large tonnage and continuous pouring. Iron is melted in front-slagging cupolas and transferred to the pulverized-coal-fired air furnaces through pouring troughs. An electric furnace also is provided for production of pearlitic malleable.

Discussion brought out clearly that for small tonnage shops with little mechanization, duplexing is more expensive as compared with air furnaces and cold charging. For large tonnage, and on the basis of units replaced, duplexing proves economical. The economy also depends upon the relative prices of scrap and pig iron. Mention was made of the need for small-capacity furnaces which would provide metal for continuous pouring, to which an equipment maker revealed such a furnace has been designed, but none has been built or installed. It can be designed for 1, 2, 3, 4 ton, or any other output per hour, is a rotary-type, pulverized coal fired, with reversing flame, and uses cold charge. Expectation is that it will show excellent economy.

Alloys For Three Purposes

At one session, with W. Punko, Wehr Steel Co., as chairman, George A. Watson, Electro Metallurgical Sales Corp., Detroit, spoke on "Effects of Alloys in Ferrous Metals." In his introductory remarks he described the production of the various alloying agents and the source of supplies of raw materials for their manufacture. Alloys in steel are used under three general classifications of deoxidizers, scavengers and true alloying. Under the latter application alloys are employed to gain increased physical properties such as strength, ductility, impact resistance, hardness, etc., to provide abrasion, corrosion or heat resistance, and to improve electrical properties. Mr. Watson then described the individual alloying elements and their effect on steel, discussing manganese, silicon, chromium, nickel, molybdenum, tungsten, vanadium, copper, and boron.

In a following session directed by Chairman Kenneth Geist, Allis-Chalmers Mfg. Co., Joseph A. Gitzen, Delta Oil Products Co., Milwaukee, dealt with the influence of mold atmospheres. He pointed out that while various materials such as seacoal have been added to molding sands for years, it is only recently that their effectiveness has been understood. Due to the high temperature conditions encountered it is difficult to obtain precise evaluations, but indications are that the reducing atmosphere developed by gasification of seacoal, for example, prevents formation of oxide on the surface of gray iron, and metal free from oxide does not wet the sand grains. Hence, a smooth surface is obtained on the casting. In the case of magnesium alloy and aluminum alloy castings application of fluorine compounds apparently flush out oxygen from the mold cavity or combine with it so that none is available to affect the molten metal, and sounder and cleaner castings are obtained. Mr. Gitzen predicted that in the future various chemicals would be employed in sand to gain beneficial effects.

Examine Core Blowing

Patternmakers devoted four sessions to a study of various developments in their field. The first meeting comprised a roundtable discussion of coreblowing equipment under the direction of Paul Riedel, Production Pattern Co., Milwaukee. It was pointed out that a tight fit is required between magazine and corebox to prevent sand blowing through the joint and causing wear, use of a rubber gasket had been tried, but it seems to lose resiliency after a time and does not seal effectively. Mention was made of methods to prevent wear in the corebox opposite blow holes, including use of steel, brass, copper and rubber at such points.

Some claimed that copper outwears brass and steel, and that brass is better than steel. Difficulty with natural rubber is that it swells due to absorption of oil while in the case of synthetic rubber, no satisfactory bonding agent has been found, and it tends to loosen after a short period. One speaker stated that he had found cellulose-type masking tape worked well. Attention was drawn to the necessity of making well-fitting core driers to prevent sagging and other troubles. In a discussion of use of wood coreboxes on coreblowing machines, an example was shown of the heavy reinforcement required in the case of one for a large core to prevent springing and spreading of the box.

Second session which followed with William P. Schmidt, Giddings & Lewis Co., as chairman was featured by presentation of a paper on "Permanent Molds for Aluminum Castings," by Vincent J. Sedlon, Master Pattern Co., Cleveland. He stated that factors to be considered in design are distribution of metal, and radiation and retention of heat developed in operation. Mold wall thickness varies from ¾ to 1½ in. or more depending upon size and character of the casting. Rule-of-thumb method is to make the wall four times the thickness of the casting, but not less than ¾-in. for practical reasons. Substantial ribs and flanges are cast on the back for strength, and clamping lugs and clamps are provided. Other factors include the determination of the best parting, provision of supports for sand cores if required, allowance for metal shrinkage, and draft for casting removal.

The average 5 to 10 lb casting with ¼ to ½-in. wall thickness can be made at the rate of 30 per hour with a manually operated mold. Larger and heavier castings, require longer intervals between pouring times. For example a 10-in. frying pan in a single cavity, hinge mold operated by one man may be produced at the rate of 40 per hour while a 2-ton manually operated mold by two men for a bandsaw housing 36 in. long, 14 in. wide and 5 in. in depth produces one every 8 minutes. Small castings may be produced in multiple cavities of two or more. Life of a mold for aluminum castings may be 30,000 to 80,000 pourings.

Cavity of the mold is given a coating to protect the surface as well as prevent adhesion of the metal. It usually is sprayed on evenly, and at intervals whenever it shows wear. Down sprue, gates and risers are painted heavily with a gate wash to insulate those areas and prevent chilling of the molten metal. While in many cases the close pouring intervals keep the mold at the proper operating temperature, it sometimes is necessary to use gas flames for additional heat. Conversely, some areas may require air cooling to provide proper chilling. Usually the molds are preheated to 650 to 800 F before starting.

Advocates Use of Models

Third patternmaking session related to "Pattern and Casting Engineering," with A. F. Pfeiffer, Allis-Chalmers Mfg. Co., West Allis, Wis., as the speaker. A. M. Fischer, Chas. Jurack Co., was chairman. Mr. Pfeiffer pointed out the important position patternmaking occupies in the production of castings, and urged that those in the field strive for some real recognition. He decried the practice of purchasing patterns on a price basis, saying that in such cases you get what you pay for—usually a poor job. In ordering pattern equipment every detail should be specified so that the resulting pattern can be placed in use in the foundry without any changes. He described the use of models and stated that they aided considerably in developing suitable patterns since the engineers could be made to see why changes were required to make satisfactory castings. Mr. Pfeiffer also showed many illustrations of pattern changes which saved time and money.

At the final session of pattermaking, under the direction of F. M. Frankard, Delta Mfg. Co., M. E. Kohler, Scientific Cast Products Co., Cleveland, presented an illustrated talk on the manufacture of pressure cast pattern plates. Various steps in the procedure were outlined with numerous views showing the wide scope

(*Concluded on page* 158)

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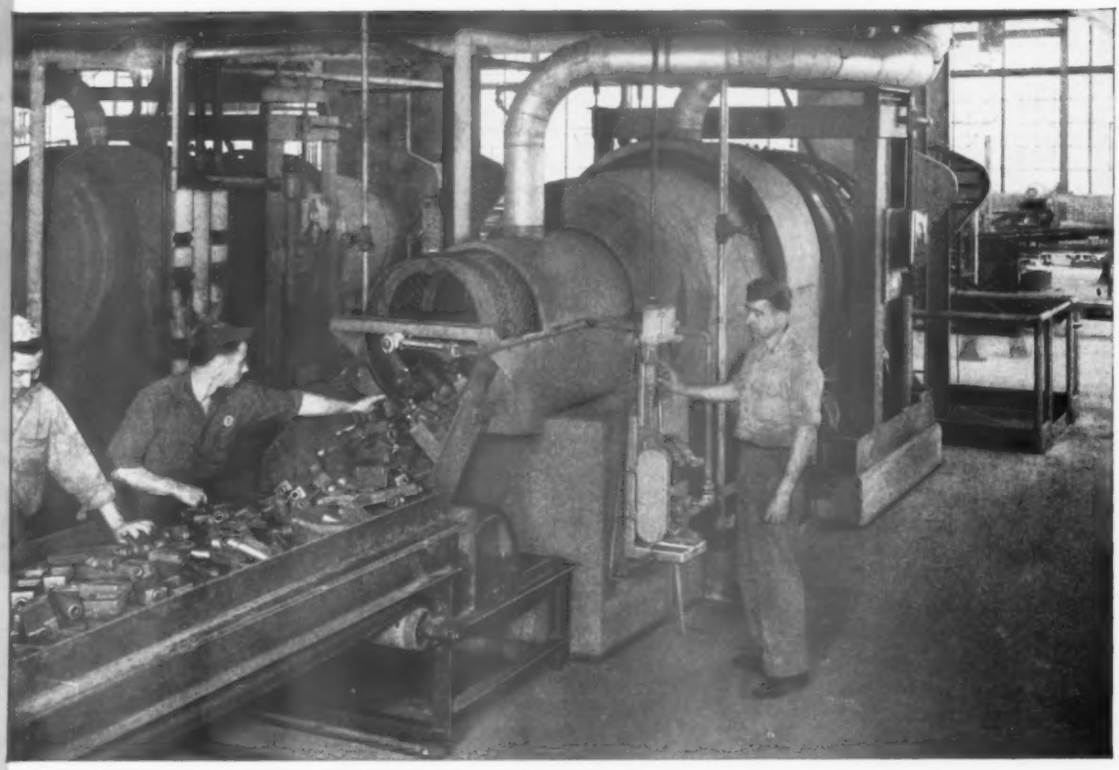

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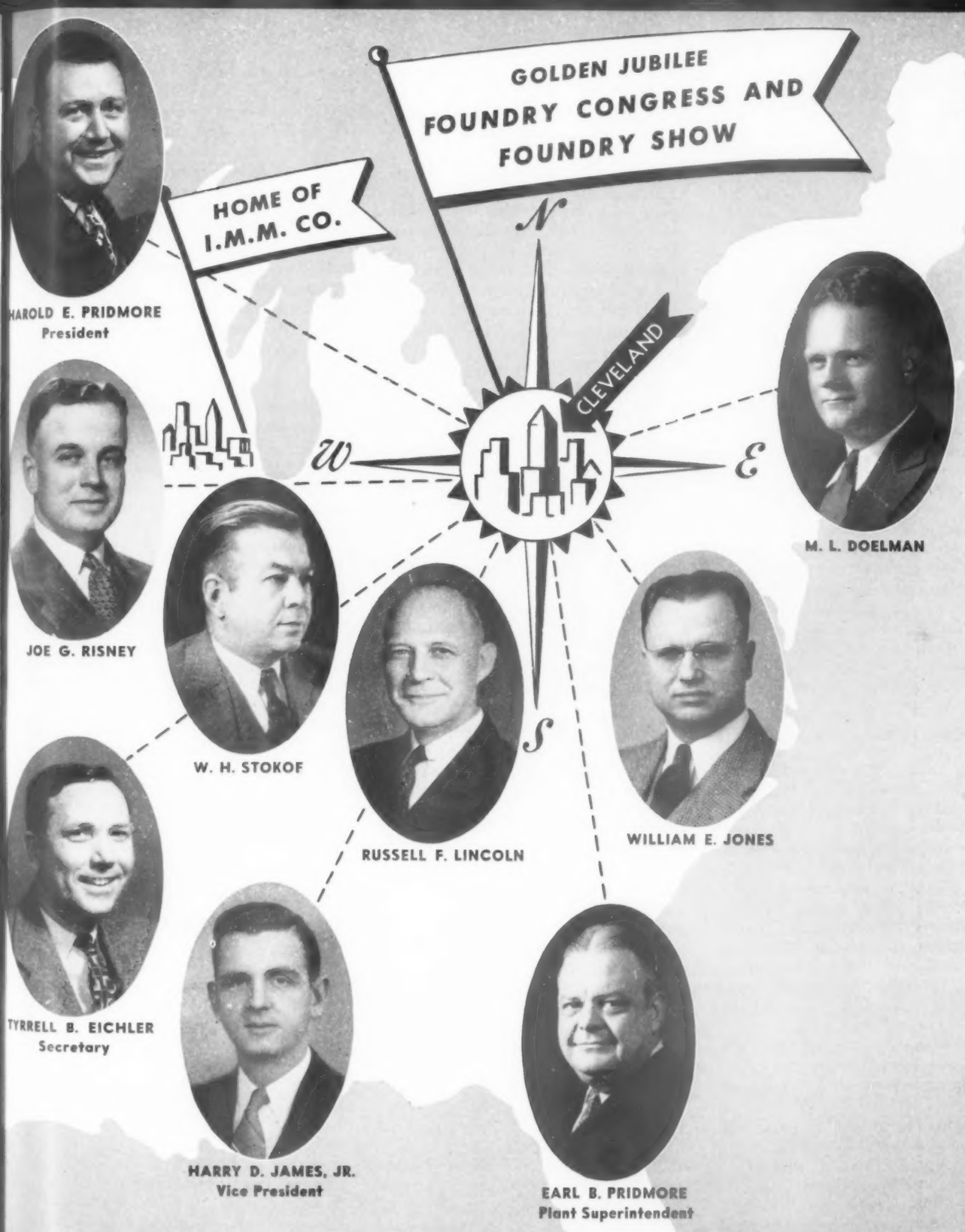

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(*Concluded from page* 154)

of patterns which could be handled. Mr. Kohler pointed out that the customer should include information on pattern spacing if gang cores are to be used, and the coreboxes are made elsewhere; to specify the location of stiffening ribs, clamping lugs, etc., since the plate maker would not know just what was required.

Various phases of steel casting production were considered at several sessions. The first was on the subject of sand reclamation, under the direction of C. E. Westover, Westover Engineers, and R. Munson, Maynard Steel Castings Co. Speaker was E. C. Jeter, Ford Motor Co., Dearborn, Mich., and he compared the two methods in general use in reclamation of core sands. One is the wet method, which is accomplished by wet scrubbing, wet classification and drying. The other, a dry method, involves burning the sand at 1300 to 1500 F in rotary or vertical kilns, scrubbing in the dry state and classifying.

There are several successful installations for reclaiming sand by the wet method in ferrous foundries. During the war there were several successful installations of the dry system in aluminum and magnesium foundries. Both reclamation methods produce a sand with a 30 per cent loss of tensile strength as compared to new sand. For automotive cores all clay and oil adhering to sand grains must be removed entirely. That, according to the speaker, is not so essential in steel foundry operation or in the production of large castings.

Consider Types of Risers

Second meeting followed and due to the speaker, Howard Taylor, Massachusetts Institute of Technology, Cambridge, Mass., being detained by a grounded plane, a discussion panel composed of Carl Haertel, Falk Corp., Milwaukee; Samuel Bellis, Burnside Steel Foundry Co., Chicago; Milton Karrer, Crucible Steel Castings Co., Milwaukee; Frank Limacker, Bucyrus-Erie Co., Milwaukee, and Victor Ziemer, Maynard Steel Castings Co., Milwaukee, was formed to discuss heading and gating of steel castings. Topics considered were the Williams riser, Washburn (neck-down) riser, and oil-sand cores versus carbon rods for introducing atmospheric pressure into blind risers.

Fundamentals of heat treatment was the topic of another session, under the chairmanship of S. Mueller, Falk Corp., Milwaukee and H. C. Stone, Belle City Malleable Iron Co., Racine, Wis. Prof. George Barker was the speaker, assisted by Prof. Phillip Rosenthal, both of the University of Wisconsin. Importance of a thorough understanding of the fundamentals and theory of practical heat treatment was stressed. The iron-carbon diagram was explained by showing many slides to illustrate the micrographic structure of steel subjected to a variety of heat treating temperatures. The Jominy test for hardenability, the S-curve (austenite transformation at constant temperature), and the TTT-curve (time-temperature-transformation) also were discussed.

Final meeting was addressed by Dr. James T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., on "Centrifugal Casting in Nazi Germany." Lester Hargrave, Bucyrus-Erie Co., and Eugene Schnieder, Grede Foundries, were chairmen. Dr. MacKenzie spent several months in Germany as a member of Foreign Economics Service, Industries and Intelligence Division, and visited many plants which had been making centrifugally cast steel gun barrels. He showed numerous slides illustrating construction of the machines used. Many of the plants visited had been practically destroyed by bombing and the skilled personnel scattered throughout Germany. In the Russian zone, plants were stripped of usable machinery which was shipped to Russia.

Castings Successful In Aircraft Use

By E. K. SMITH
Consulting Metallurgist
Beverly Hills, Calif.

GOOD news for foundrymen! That was the writer's impression of a revolutionary talk given by T. E. Piper, chief materials and process engineer of Northrop Aircraft Inc., at the February meeting of the Southern California Chapter of the American Foundrymen's Association.

Foundrymen have become so accustomed to being blamed for casting troubles, that it was startling to have a leading aircraft technician assume part responsibility for the quality of aircraft castings, and to have him report the extremely successful use of castings for parts which, in the past, would ordinarily have been made of other forms of metals.

Mr. Piper startled some of his audience with his opening statement that the famous Black Widow Night Fighter contains 1028 castings. These included many nonferrous castings, and steel castings heat treated to very high strengths.

The following notes simply cover some of the high spots in Mr. Piper's interesting informal talk, and the publication of his complete paper will be awaited with interest.

Past History: Due to weight and design considerations aircraft engineers could not take any chances on defective castings, and when castings were decided on for highly stressed parts, procedures were set up, which insured perfectly safe castings. (And flying results have shown that the castings *are* safe).

Procedure: 1. All castings were tested with specially designed fluoroscopic equipment. All castings showing defects were scrapped.

2. Of the castings accepted fluoroscopically, 25 per cent were tested radiographically. All castings unacceptable by radiograph were scrapped.

3. Of the castings accepted by radiograph, the three showing the least perfect structure were tested to destruction. These three structures were then used as radiographic rejection standards.

4. Radiograph and fluoroscope operators were provided with drawings of all castings, showing the positions where no structural irregularities could be accepted, and the areas where slight irregularities would not be detrimental. (Mr. Piper used the word "irregularities" for anything showing on the radiograph, from micro-shrinkages to segregations. "Defective" castings were not accepted).

Co-operation: One advantage of castings is that, as often required in aircraft, a relatively small number can be made economically and rapidly.

Aircraft gets excellent castings, and *pays* for such excellence.

Constant co-operation between the designer and the foundryman is essential. (Mr. Piper aroused spontaneous applause from his foundrymen audience, when he remarked that when good castings cannot be made from a certain design, that design should be changed).

Future: Much work is under way at present. Many problems have been solved, some remain.

Proper design and secondary shrinkage must be correlated.

Standards must be set up to determine what amount of structural irregularity can be tolerated, so that the castings will be perfectly safe.

Castings have won their place in aircraft.

Truck Association Elects Officers

At a recent meeting held in New York, the Electric Industrial Truck Association elected the following officers: President, Gordon J. Berry, vice president, the Electric Products Co., Cleveland; vice president, F. J. Shepard Jr., treasurer, the Lewis-Shepard Sales Co., Boston. Charles F. Kells, Pittsburgh, will conduct the educational program for the association. E. W. Allen, Thomas A. Edison Inc., is retiring president of the association, which comprises major producers of electric trucks, batteries and chargers.

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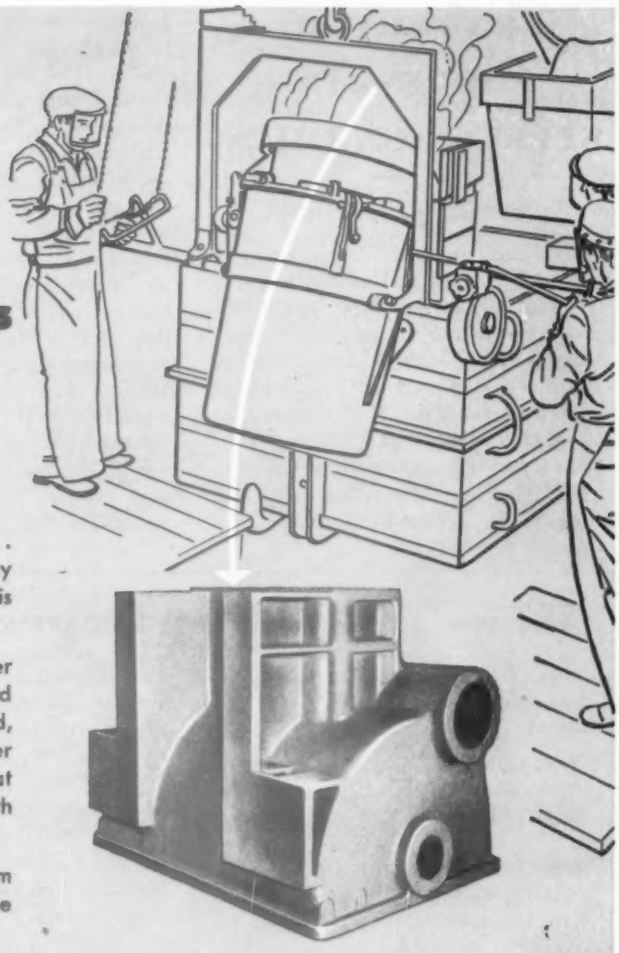

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CONVERTER PROCESS IN STEEL FOUNDRIES

(*Continued from page* 107)

of the flame" occurred. The vessel was then turned down, and melted ferrosilicon—generally of the 10 per cent grade—was poured into the bath. The blast then was turned on, and blowing was resumed and continued until this added silicon was oxidized. Snelus states that the rapid combustion of the silicon gave steel of greatly increased temperature.

It is doubtful if Snelus was correct in attributing the loss of temperature in the older methods to the heat carried away by the CO, and in stating that the silicon always was oxidized rapidly in the Walrand & Legenisel method. This may be inferred by his account (in the second article referred to) of the use of the process in an English shop, where the blow was interrupted and the silicon added when the bath still contained some 1.30 per cent C. One reason for adopting this practice was to secure a carbon flame near the end of the second blow, so that the "drop" of the flame would signalize the elimination of the silicon and carbon. Without this carbon, the length of the second blow would have had to be calculated from the weight of silicon added and the volume of air passing per second.

A second, perhaps unrecognized, reason for this change in the Walrand-Legenisel process, however, was probably that it was found desirable to have part of the added silicon oxidized while the bath was agitated by the evolution of CO. At the temperature of the cupola iron of the initial charge, silicon has a much higher affinity for oxygen than has carbon, so that but little carbon is burned until the initial silicon of the charge is largely eliminated. However, as the temperature is increased, the relative affinities of carbon and silicon for oxygen alter, and finally are reversed.

Probably, then, the temperature of the metal at the beginning of the second blow in this modified form of the Walrand-Legenisel process was high enough so that carbon began to oxidize while considerable silicon was still present. The result would be a strongly boiling bath, a rapid oxidation of the silicon, and a minimum loss of heat by radiation and by heating up of the nitrogen, as already described. Without the presence of the carbon, there would be no spontaneous boiling of the bath, and it is doubtful if the oxidation of the silicon would really have been raipd, as Snelus described it. At any rate, the process thus modified appears to have produced fairly satisfactory steel for small castings.

Swedish Experiments Successful

The most successful use of small bottom-blown converters, however, was in Sweden. In fact, the very earliest experiments with the bessemer process there were successful, while Bessemer in England was for some time embarrassed in his development of the process by the fact that his steel was "hot-short." In an effort to overcome this difficulty, Bessemer at first resorted to remelting his product in crucibles. On investigating the Swedish work, Mushet, an English metallurgist, observed that the pig iron being blown in Sweden contained several per cent manganese and that some of the manganese remained in the steel at the end of the blow. Suspecting that this was the reason for the Swedes' success Mushet tried adding manganese in the form of the ferroalloy to the bessemer metal at the end of the blow, and thereby became the first to deoxidize the blown metal and make it workable.

The added manganese served both to reduce the FeO in the steel (by the reaction $Mn+FeO=Fe+MnO$) and to combine with the harmful iron sulphide and change it to manganese sulphide. Iron sulphide forms inclusions in thin films between the crystals of the steel, making it weak when red-hot, while manganese sulphide forms roughly spherical globules in the steel which have little effect on its properties, either hot or cold. In addition, some of the manganese

(*Continued on page* 162)

How To Figure Depreciation

By ALBERT E. GROVER
Cost Engineer
Berea, O.

IT HAS long been the accepted accounting theory to consider depreciation in the light of recovering, though the sales of product, the actual cost of the physical property. The practice of this theory has been greatly stimulated by the rulings set down by the federal income tax law which demand that this practice be strictly adhered to when reporting profits for taxation.

In this period of reconversion some accountants and industrial engineers are giving serious consideration to the establishment of improved cost procedures one element of which is depreciation.

If the foundryman is to meet competition with a sound cost program, there must be uniform treatment of depreciation on all operating facilities.

Foundry organizations are quite likely to find themselves in possession of:

1. War emergency facilities owned by the government and still in use.
2. War emergency facilities purchased from the government and in use.
3. Company-owned facilities purchased under certificates of necessity, and which have been fully amortized.
4. Facilities owned by the company previous to the war for which no certificate of necessity was honored: a—On the books at original cost. b—Still in use but fully depreciated.

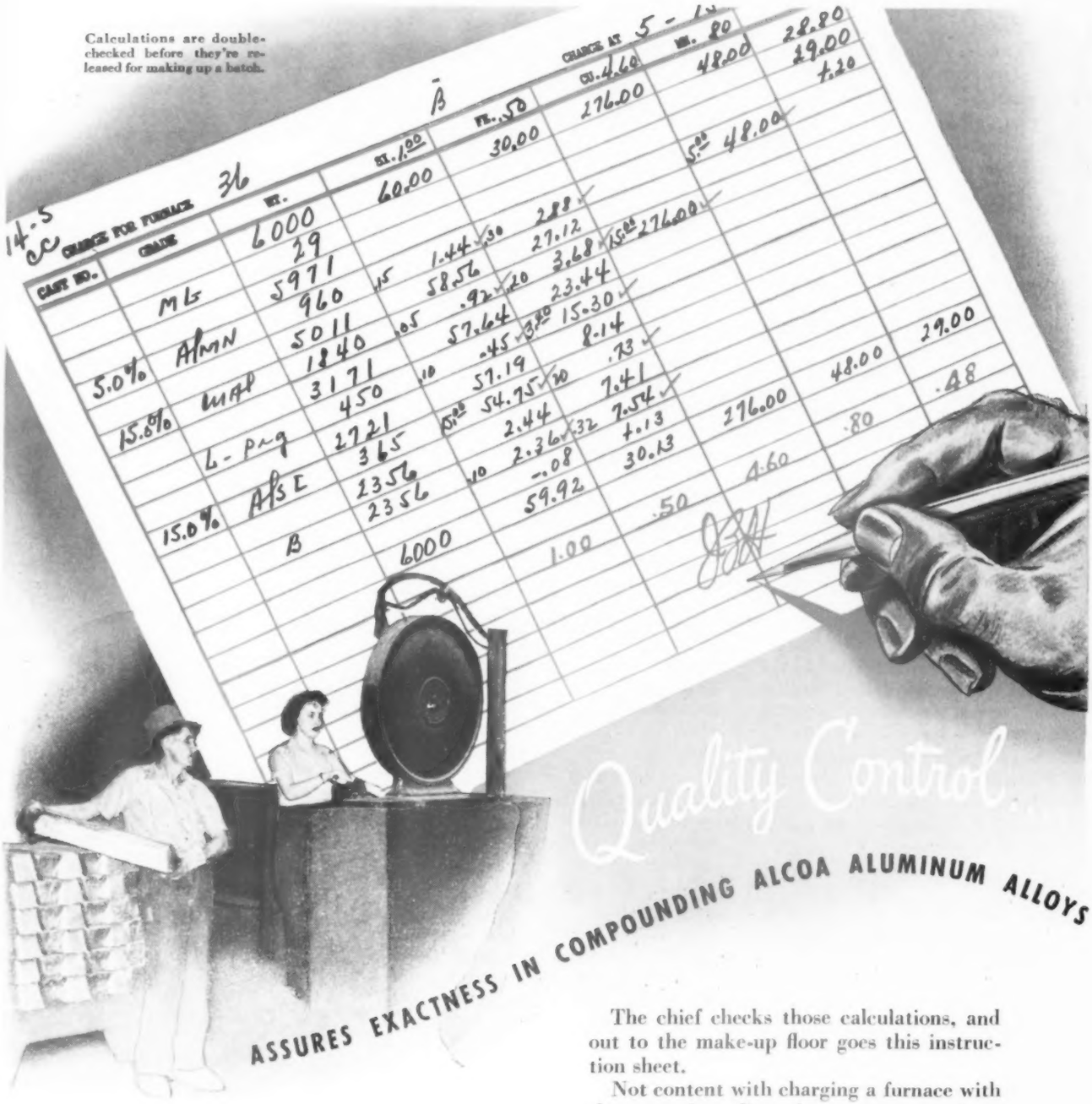
The values of separate operating facilities being influenced by such varying conditions indicate the necessity of establishing sound reproduction values for the determination of dependable depreciation charges. These values can best be established by experienced appraisers; however, sometimes this service is not available and the foundryman must take other means of establishing these values. The following procedure has been used, quite successfully, in another industry:

1. Prepare a table representing the approximate increase in manufacturing costs of operating facilities from certain prior periods to present year. For example:

From 1914 to 1920	add	300%
From 1921 to 1926	add	100%
From 1927 to 1935	add	90%
1936	add	80%
1937	add	70%
1938	add	60%
1939	add	60%
1940	add	50%
1941	add	40%
1942	add	20%
1943	add	10%
1944	add	0%
1945	add	0%
1946	add	0%

2. Add to the original cost (new) the percentage shown in the period when the facility was purchased and installed. That will be an approximate cost of the facility if it were manufactured in the present period. For example:

Original cost of a facility in 1939	$5000
Plus—60% (shown in table)	3000
Equals—Reproduction cost in 1946	$8000


Calculations are double-checked before they're released for making up a batch.
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ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

(*Continued from page* 160)

sulphide floats to the surface of the steel, where the sulphur is oxidized to SO_2 and eliminated from the bath.

For thus saving Bessemer's process from threatened failure, Mushet at first got little recognition, especially from Bessemer himself, but in later years received the Bessemer medal of the Iron & Steel Institute of Great Britain.

However, in addition to this deoxidizing effect of the remanent manganese, there was a further advantage in blowing metal containing several per cent manganese, in addition to the usual silicon and carbon. This was, that the carbon frequently began to burn before the silicon and manganese were reduced to very low percentages, so that the three metalloids were oxidized more or less at the same time. Because of the boiling due to the evolution of CO, the resistance to the passage of the blast was less, the blow was shorter and the steel hotter than when silicon alone was relied upon as the source of heat.

Akerman[5], in an article published in 1893, gives particulars of Swedish practice and tells of the contributions of Goranssen, Swedish metallurgist, to the success of the process there. Harbord and Hall, in their 1904 edition (page 81), quote extensively from Akerman's article and also give particulars of similar practice elsewhere. In some of their diagrams it is noticeable that the carbon, manganese and silicon are oxidized more or less at the same time.

Produce Hot Steel

The present author, in producing in this country steel for small castings in a 3-ton bottom-blown converter, found it impossible to secure satisfactorily hot steel when silicon was used as the chief source of heat, but by adopting the Swedish practice was able to blow steel hot enough to pour small castings. The metal charged to the converter averaged about 1.25 per cent Si, 1.80 to 2.20 per cent Mn and, of course, the usual 3.5 to 4 per cent C. The manganese was obtained from austenitic manganese steel scrap, which at that time was rather a drug on the market because of its high phosphorus content, which made it unsuitable for any but basic open-hearth steelmaking.

In blowing metal of this composition, with fairly hot metal from the cupola, the carbon flame appeared in from 2 to 3 minutes, and the total time of the blow averaged 8 minutes. By way of contrast, when the converter charge contained 2 per cent Si and 0.40 to 0.60 per cent Mn, the carbon flame would not appear till after 6 to 8 minutes blowing, and the total blowing time was 12 to 14 minutes, or even longer. As stated before, the steel produced when the high silicon metal was blown was seldom as hot as desired, whereas uniformly hot steel resulted from the use of the high manganese-low silicon charge.

For the greater part of the blow, when using the higher manganese mixture, of course, the bath was violently agitated by the evolution of CO, so that the air passed through the bath quite freely and the silicon and manganese were oxidized rapidly. The result, as already described, was that less heat was lost by radiation and carried away by the nitrogen of the blast, in blowing the high manganese metal than when high silicon-low manganese charges were blown. As a result, though actually less total heat was evolved by the high manganese than by the high silicon metal, yet it produced hotter steel. As the bath was boiling almost throughout the blow, extra ferrosilicon could be thrown in to increase the temperature at any time when the steel seemed to be blowing "cold".

Flame Dropped Early

The only disadvantage found in the use of the high initial manganese (aside from a tendency to "slop", on account of the fluidity of the slag) was that when the cupola metal was unusually hot, it sometimes happened that the flame would "drop" before the carbon was eliminated to the desired extent. Apparently, in these cases, an extra hot charge heated up rapidly to the point where carbon was oxidized in preference to silicon and manganese, while there were still considerable amounts of those metalloids present. The oxidation of carbon alone then produced insufficient heat to keep the steel at temperatures where the diminishing carbon could continue to be oxidized in preference to the other metalloids, which were still present in considerable percentages. The silicon or manganese would then again monopolize the available oxygen and the oxidation of carbon would nearly cease, with a resulting disappearance of the flame. After several minutes further blowing, the silicon and manganese would be largely eliminated and the carbon flame would reappear, to "drop" for good in some 45 or 60 seconds.

Whether or not this is the true explanation, it is a fact that in some cases we "turned down" blows that showed a distinct drop of the flame but proved to contain some 0.25 per cent C and 1 to 1.20 per cent Mn. In other blows that showed this first "drop," if blowing were continued the flame would re-appear, as just described, and drop again. In such cases the final carbon and silicon were usually about 0.08 per cent and the manganese not over 0.15 per cent.

For the most part, the blown metal produced as just described was used to mix with molten 80 per cent ferromanganese to make austenitic (12 per cent) manganese steel. For this purpose the method was entirely successful. When carbon steel with carbon below about 0.35 per cent was attempted, however, the steel, though hot, was frequently found to be gassy, for reasons which will be discussed in detail later.

The real success of the converter process in making steel for small carbon steel castings dates from the invention of the side blown converter by A. Tropenas. In principle, this was a reversion to the Robert type of vessel but with the added feature that the blast was introduced entirely above the metal, instead of partly above and partly below its surface. That this should have resulted in the production of hotter and less gassy steel than that made in vessels where the blast was introduced through the metal, appears somewhat surprising; nonetheless, it is a fact.

Following the then-popular reasoning, it was at first supposed that much hotter steel would be produced if the process were so conducted that a large proportion of the carbon was burned to CO_2 inside the converter, and the early Tropenas vessels had two rows of tuyeres, one set a few inches above the other. The upper tuyeres were provided for the purpose of burning CO to CO_2 inside the vessel, air being admitted only to the lower tuyeres until the carbon flame appeared. Then the valves controlling the upper row of tuyeres were opened and air was admitted through both sets. This feature has long been abandoned, and its advantages were probably more theoretical than actual.

Decrease Blowing Cost

The Tropenas vessel in its original form was shaped so as to give a narrow, deep bath. Modern practice has abandoned this feature also, and side-blown converters as now made are quite wide compared with their height. The air blast is provided by a positive pressure blower at some 3 to 6 oz pressure, instead of the 20 to 30 lb required by bottom-blown vessels, which results in a greatly decreased blowing cost. The air is brought through a wind pipe in one trunnion, to a wind box on one side of the converter, at about the level of the top of the bath. Tuyeres consisting of hollow brick or of steel pipes, eight or ten in number, carry the blast from the wind box into the interior of the vessel. In contrast to bottom-blown practice, where the air is introduced through a large number of small holes in the tuyeres, these pipes are at least an inch in inside diameter, frequently more.

(*Concluded on page* 164)

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(*Concluded from page 162*)

For charging, the converter is brought to the horizontal position, with the wind box and tuyeres on the upper side, and as nearly as possible the correct amount of metal is poured in from the cupola ladle. The vessel is then slowly turned up, one man watching through the open wind box and the tuyeres and signaling when the metal is just on a level with the mouths of the tuyeres. At this time the inclination of the converter should be about 10 or 12°. If it is more nearly upright, more metal is added to correct the angle; if the inclination is too great, metal is poured back into the cupola ladle for the same purpose. When the angle is correct, the cover of the wind box is clamped in place and the blast turned on, the converter generally being first tipped some 3 or 4° further forward, so as to allow the blast to strike the metal well away from the converter wall.

Raise Metal Temperature

The "blow" in these converters differs considerably from that in bottom blown vessels. Apparently, the reactions by which the metalloids are eliminated and the temperature of the metal is raised, occur in several distinct stages. Commonly, the metal from the cupola contains from about 1.40 to 1.80 per cent (or even 2 per cent) Si, with Mn below 0.80 per cent, and the usual amount of carbon. When the blast is first turned on, only sparks and a faint yellow flame appear at the mouth of the converter. Silicon and manganese are being oxidized at this stage, and probably the oxidation is confined largely to the upper layers of the bath. After a few minutes, a bright but short carbon flame appears, when the silicon in the upper layers of the bath has been brought to a low enough figure and the temperature is high enough for carbon to start burning. To maintain the flame the converter is generally brought 2 or 3 degrees nearer the vertical, as soon as this "light" is secured.

After a few minutes more blowing, the carbon flame lengthens greatly, the bath appears to boil violently throughout its depth and showers of slag are thrown from the mouth of the vessel. This is the "boil," and while it lasts, the air pressure is reduced to around 2 oz to prevent the action from becoming so violent as to throw metal from the vessel.

It is supposed that the cause of the boil is a reaction between the carbon of the underlying layers of the charge and FeO in the slag. Before the boil oxidation has been largely confined to the surface layers of the bath, and when most of the silicon has been converted to SiO_2 and the manganese to MnO, a considerable amount of iron is oxidized to FeO, while carbon is being burned. These products of oxidation unite to form a slag composed of the silicates of iron and manganese which grows richer and richer in FeO as the blow proceeds. Finally, carbon migrating from the lower layers of the bath starts to react with this highly oxidizing slag, and soon the boil is in full swing. After a minute or two, the violent reaction subsides, the flame shortens in, and quieter blowing is resumed.

The flame remains quite short for several minutes after the boil subsides, silicon again being oxidized more than carbon, and considerable iron also is burned to FeO and enters the slag. Soon the flame begins to lengthen again, and under normal conditions it remains long, feathery-edged and brilliant until the carbon is reduced to about 0.08 per cent, when a characteristic drop of the flame occurs, signaling the end of the blow. The vessel is then turned down, and the blast is shut off. The total blowing time in modern practice is from 15 to 20 minutes.

As in the older bottom-blown practice, it has long been customary, if the steel seems to be blowing "cold" (as indicated by the appearance of the flame), to throw lumps of 50 per cent ferrosilicon into the converter during the early stages of the carbon flame period. Combustion of this added silicon serves to raise the temperature of the steel, and once the carbon flame has been well started the addition of the silicon does not stop the oxidation of carbon and the resulting flame. Rather, the silicon seems to be oxidized at the same time as the carbon.

Introduce the Electric Eye

In recent years, the electric eye has been introduced in converter practice, and has served to signal the drop of the flame far more precisely than when the flame is observed through blower's glasses, and where the experience of the blower is relied upon to catch the right moment to turn the vessel down. This has resulted in a much closer control of the final composition of the blown metal, and of the degree of oxidation resulting from the burning of iron when it is no longer protected from oxidation by silicon, manganese and carbon, than was formerly possible. At the same time, the blower is enabled to judge the temperature of the blow better than is possible by visual inspection of the flame, and so to proportion his additions of ferrosilicon to better advantage.

During the "final flame" period, the bath boils quite hard, and it is usually necessary to reduce the air pressure every few moments to prevent loss of metal As it is, quantities of slag and some particles of metal are ejected from the vessel. There can be little doubt that a large part of the carbon eliminated from the metal during this period is oxidized, not directly by the blast, but by FeO in the slag, which has been oxidized during the quiescent period preceding the appearance of the final flame. The boiling of the bath is far too active to be accounted for by oxidation only from the blast impinging upon the surface of the metal, and strongly suggests reaction with an oxidizing slag.

In the opinion of the present author, in addition to the large amount of heat produced by the combustion of the silicon, a further increase of temperature of the steel is due to the oxidation of iron which also produces a great deal of heat. In the side-blown converter, obviously, conditions somewhat resemble those in a bottom-blown converter that has been tipped forward while blowing, enough to allow one or more of the tuyeres to blow over the surface of the metal. As already mentioned, it has long been standard practice in blowing the large bottom blown vessels, to warm up a heat that is blowing "cold," by tipping the vessel forward in this manner. So much extra heat results from the combustion of the iron so oxidized that a few minutes blowing in this position greatly increases the temperature of the steel.

Metal Loss Is Greater

For many years, steelmakers were afraid to mention "oxidation" of their metal, and no doubt partly for this reason it was fashionable to ascribe the extra temperature of side blown converter steel to the combustion of CO to CO_2 inside the vessel. Iron, however, undoubtedly produces most of the extra calories. One proof of this is the considerably greater blowing loss in the side-blown vessel as compared with the bottom blown (some 12 to 16 per cent, against 7 or 8 per cent), the extra loss being more than can be accounted for by the metal ejected in blowing.

Further doubt is thrown on the theory that carbon is burned to CO_2 inside the vessel, by the length and brilliance of the flame pouring from the mouth of the vessel. As in bottom-blown practice, it is obvious that combustion of the CO is not taking place within the vessel to any marked extent, for if it were, the flame would be far shorter and less active and brilliant.

(*To be concluded next issue*)

References

3. U. S. Patent No. 503,816 Aug. 23, 1893.
4. *Journal*, British Iron & Steel Institute, Vol. 1, 1894, page 26; Vol. 2, 1896, page 104.
5. *Transactions*, American Institute of Mining and Metallurgical Engineers, Vol. XXII, page 265.

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A GLOSSARY OF TERMS EMPLOYED IN THE FOUNDRY

(Continued from March issue)

KNOCK OUT—To remove sand and casting from a flask.

LADLE—Metal receptacle lined with refractory for transportation of molten metal. Types include hand, bull, sulky, trolley, crane, bottom pour and teapot.

LIFTER—An L-shape molder's tool with a long shank and short arm. It is used to lift sand from the bottom of a mold.

LINING—Inside refractory layer of firebrick, clay, sand or other material in a furnace or ladle.

LIQUID CONTRACTION—Shrinkage or contraction in molten metal as it cools from one temperature to another while in the liquid state.

LIQUIDUS—The temperature at which solidification of metal begins on cooling and the temperature at which the last portion of solid metal becomes liquid on heating.

LOAM—A coarse, strongly bonded molding sand used for loam and dry sand molding.

LOAM MOLDING—A system of molding, especially for large castings, wherein the supporting structure is constructed of brick. Coatings of loam are applied to form the mold face.

LUTE—To seal with clay or other plastic material.

MACHINABILITY—The capability of being cut, turned, broached, etc. by machine tools.

MACROSTRUCTURE—Structure of metals as revealed by the eye or at a magnification of less than 10 diameters.

MAGNESIA—Magnesium oxide, a basic refractory.

MALLEABILITY—The property of being permanently deformed by compression without rupture.

MALLEABLIZATION—Annealing or heat treating operation performed on white iron castings to transform the combined carbon into temper carbon.

MALLEABLE IRON—See iron, malleable.

MANGANESE—One of the elements whose chemical symbol is Mn. Its formula weight is 54.93; specific gravity 7.2 and melting point 1260 C. Metallic manganese is used in the nonferrous industry both as a deoxidizing agent and as an essential constituent to improve physical properties of certain alloys.

MANGANESE BRIQUETS—Crushed ferromanganese bonded with a special refractory in briquet form, and containing 2 lb metallic manganese and ½ lb metallic silicon.

MARTENSITE—A microconstituent or structure in quenched ferrous alloys characterized by an acicular or needle-like pattern. It has the maximum hardness of any of the decomposition products of austenite.

MASTER PATTERN—The pattern from which the working pattern is cast.

MATCH—a form of wood, plaster of paris, sand or other material on which an irregular pattern is laid while the drag is rammed.

MATCHPLATE—A metal or other plate on which patterns split along the parting line are mounted back to back with the gating system to form an integral piece.

MECHANICAL PROPERTIES—The properties of a metal determining its behavior under stress.

MELTING POT—Metal, graphite-clay, or ceramic vessel in which metal is melted.

METAL CLEANING EQUIPMENT—Casting cleaning equipment such as tumbling mills, abrasive blasting units, etc.

METALLOGRAPHY—Study or science of metal structure and alloys, particularly the visual examination by means of the microscope.

METALLOGRAPHIC EQUIPMENT—Equipment used for metallographic examination such as the microscope, specimen polishing machines, etc.

METALLOID—Having the appearance of a metal.

METALLURGY—Science dealing with the constitution, structure and properties of metals and alloys, and the processes by which they are obtained from ore and adapted to the use of man.

MICROSCOPE—Optical instrument comprised of a combination of lens for making enlarged or magnified images of minute objects or arears.

MICROSTRUCTURE—The structure and characteristic condition of metals as revealed on a ground and polished (etched or unetched) specimen at magnifications above 10 diameters.

MILLING STAR—See jack star.

MISRUN—A casting not fully formed.

MODULUS OF ELASTICITY—The ratio, within the limit of elasticity, of the stress to the corresponding strain.

MOLD—The form, usually sand, containing the cavity into which molten metal is poured to make the casting.

MOLD BOARD—See follow board.

MOLD CLAMPS—Devices used to lock or hold cope and drag together.

MOLD CONVEYOR—Power driven unit on which molds are conveyed from the molding station to pouring station to shakeout.

MOLD DRYER—Usually a portable device fired by gas, oil, coal or coke which is used to dry the cavity in a mold.

MOLD OVEN—Oven or furnace in which molds are dried.

MOLD WASH—Usually an aqueous emulsion containing various organic or inorganic compounds or both which is used to coat the face of a mold cavity. Materials include graphite, silica flour, etc.

MOLD WEIGHTS—Weights placed on top of molds to offset internal or ferrostatic pressure.

MOLDER—An operator who makes molds.

MOLDER'S BENCH—Table or bench on which small molds are produced.

This is the fifth installment of an extensive glossary of foundry terms compiled by Edwin Bremer from a wide variety of sources. In the development of this material a great amount of help has been secured from the *Steel Castings Handbook* published by the Steel Founders' Society of America, Cleveland; *American Malleable Iron* published by the Malleable Founders' Society, Cleveland, and from unpublished work of a Committee on Foundry Nomenclature of the American Foundrymen's Association, Chicago. THE FOUNDRY wishes to thank all sources from which this material has been obtained.

THE EDITORS

A GLOSSARY OF TERMS EMPLOYED IN THE FOUNDRY

MOLDER'S TOOLS—Used by a molder in making a mold.

MOLDING—The act of making molds.

MOLDING, BENCH—Making sand molds from loose or production patterns at a bench.

MOLDING FLOOR—Making sand molds from loose or production patterns on the floor. Patterns usually are too large to be handled satisfactorily on the bench.

MOLDING MACHINE—Hand or pneumatically operated machine on which molds are made and which rams the sand by squeezing or jolting or both.

MOLDING, MACHINE—Making sand molds from production patterns on molding machines.

MOLDING SAND—Mixture of sand and clay suitable for mold making.

MOLYBDENUM—One of the elements whose chemical symbol is Mo. Its formula weight is 95.95; specific gravity 10.2, and melting point about 2620 C.

MONORAIL SYSTEM—Single overhead rail from which a trolley is suspended to transport ladles, molds, materials, etc. around the foundry.

MOTTLED—White iron structure interspersed with spots or flecks of gray.

MOUNTING FRAME, VIBRATOR—Frame containing a number of patterns to which a vibrator is attached.

MUD—Wet sand or clay to close the joint of a flask or the joint between a core and sand of the mold. Also mortar in loam molding.

MULTIPLE MOLD—Composite mold made up of stacked sections. Each section produces a complete gate of castings. All castings are poured from a central down-gate.

NAIL, CHILL—Steel nail with a heavy head which is inserted in the mold wall to hasten cooling of the metal at that point.

NICKEL—One of the elements whose chemical symbol is Ni. Its formula weight is 58.69; specific gravity 8.90, and melting point 1452 C.

NITRIDING—A method of hardening ferrous alloys by adding nitrogen through heating the metal in contact with ammonia gas or other source of atomic nitrogen.

NORMAL EXPECTED VALUE—The mode obtained from a distribution curve.

NORMALIZING—Heating iron-base alloys to approximately 100 F above the critical temperature range followed by cooling to below that range in still air at ordinary temperature.

NOWEL—Colloquial term for drag mold.

NOZZLE, BLAST—Nozzle of wear resisting material through which the abrasive is ejected in a pneumatically operated abrasive blasting unit.

ODD SIDE BOARD—See follow board.

OFFSET—A box or form on which copes are placed.

OIL CORE—A core bonded with oil.

OIL FURNACE—Furnaces fired with oil.

OPEN HEARTH FURNACE—A refractory lined, shallow bath, rectangular furnace in which both hearth and its charge are subjected to the direct action of the fuel flame. Fuel may be producer gas, natural gas, coke oven gas, powdered coal or oil. Flame is created by mixing preheated air with fuel in ports. Air is preheated in regenerators called checker chambers.

OPEN-HEARTH STEEL—Steel made in open hearth furnace.

OPEN SAND CASTING—A casting poured in a mold which has no cope or other covering.

OPTICAL PYROMETER—A temperature measuring device through which the observer sights the heated object and compares its incandescence with that of an electrically heated filament whose brightness can be regulated.

OVEN—Furnace or chamber heated by coal, gas, oil, coke, or electrically which may be used for heat treating purposes, drying cores and molds, etc.

PACKING—Sand, gravel, mill scale or other similar material to support castings packed in annealing pots to prevent possible warping.

PARTING—Where sections of a mold are separated.

PARTING COMPOUND—Material dusted or sprayed on a pattern or mold to prevent adherence of sand.

PARTING LINE—The line along which a pattern is divided for molding, or along which the sections of a mold separate.

PARTING SAND—Sharp or burned sand sprinkled on the joint of the mold to prevent the sand cope and drag from adhering.

PATTERN—Model of wood, metal, plaster or other material used in making a mold.

PATTERN COATING—Coating material applied to wood patterns to protect them against moisture and abrasive of molding sand.

PATTERN LETTERS—Metal letters and figures in various sizes which are affixed to patterns for identification purposes.

PATTERN PLATES—Straight flat metal or other plates on which patterns are mounted.

PATTERNMAKER'S SHRINKAGE—Shrinkage allowance made on all patterns to compensate for the change in dimensions as the solidified casting cools in the mold from freezing temperature of the metal to room temperature. Pattern is made larger by the amount of shrinkage characteristic of the particular metal in the casting and the amount of hindered contraction to be encountered. Rules or scales are available for use.

PEARLITE—A microconstituent of iron and steel consisting of alternate layers of ferrite and iron carbide or cementite.

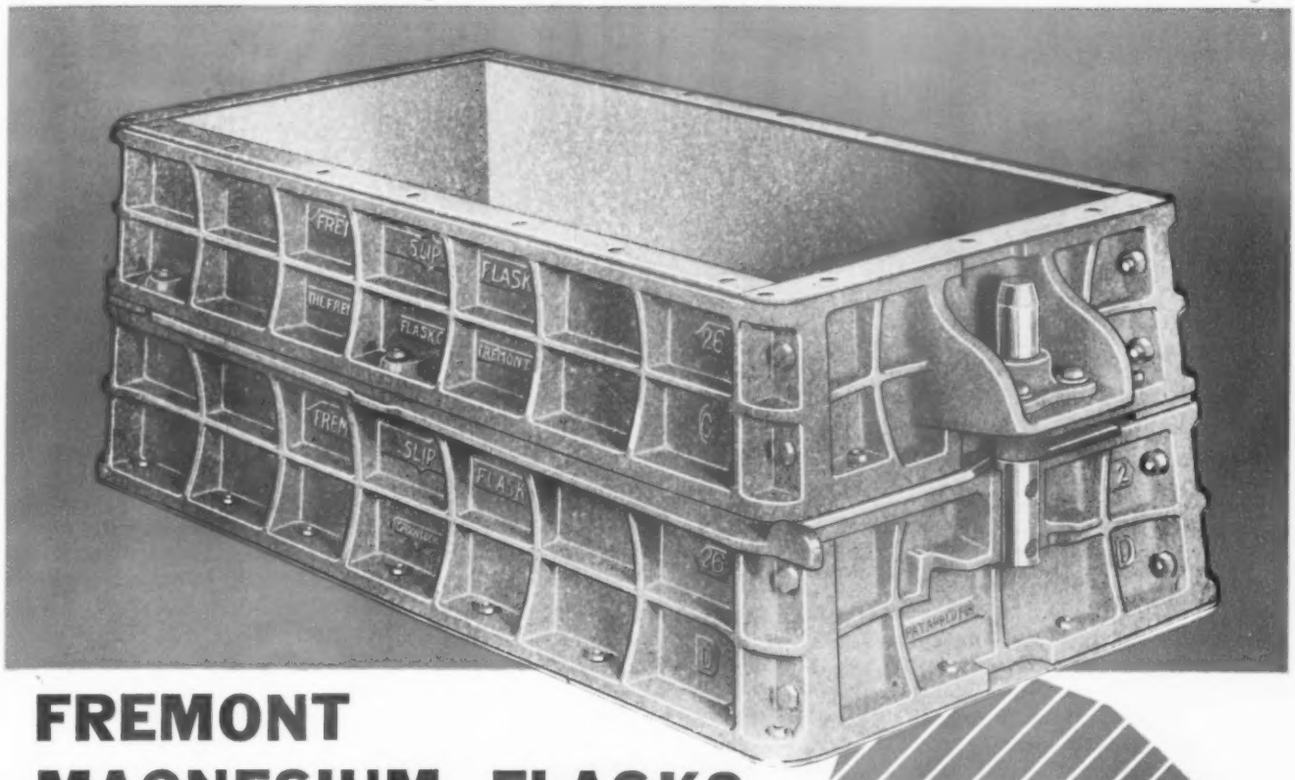
PEEL—A broad blade, long-handled shovel-like implement used by melters for lifting heavy scrap into the furnace.

PEEN—Small end of a molder's rammer.

PERIODIC ANNEALING FURNACE—Where the castings go through a complete cycle of preheating, soaking and cooling.

PERITECTIC TRANSFORMATION—The transformation of delta iron plus liquid metal, depending on the carbon content, into the solid phase of delta plus gamma iron, or gamma iron, or to gamma plus liquid melt phase. This transformation takes place at 2715 F.

(To Be Continued)



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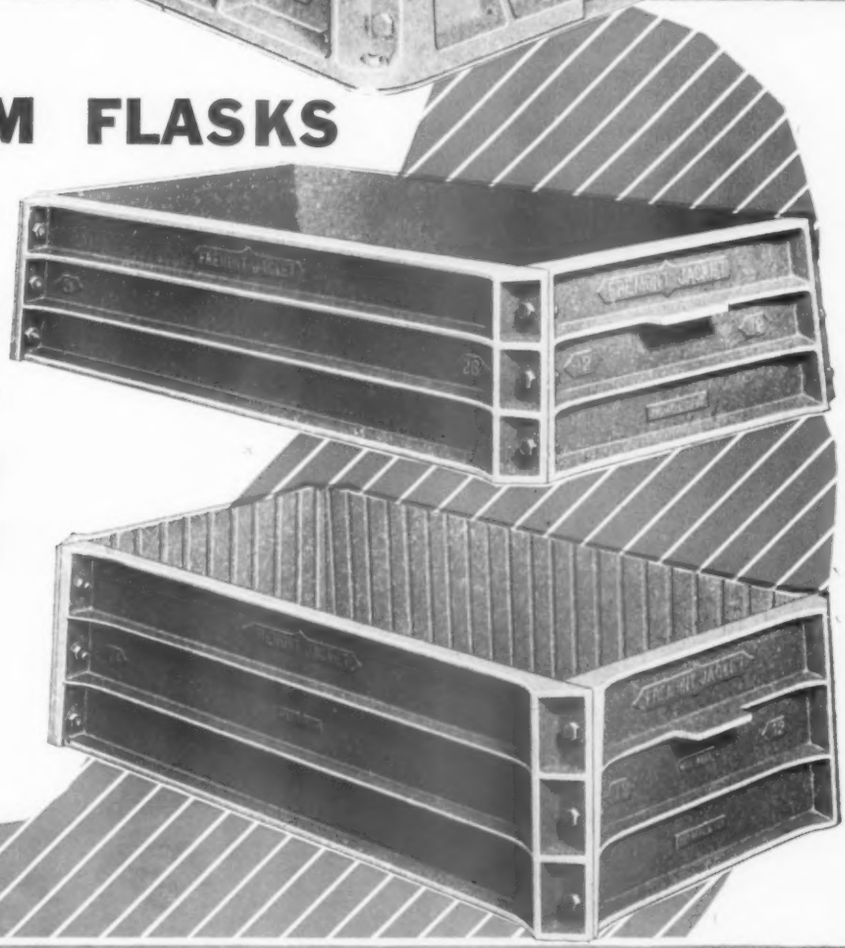

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Activities of foundry GROUPS

Western Michigan

REGULAR monthly meeting of the Western Michigan Chapter of the AFA was held Feb. 11 at the Hotel Schuler, Grand Haven, Mich., with 100 members and guests present. Fred C. McCarthy, vice chairman, presided in the absence of Chairman J. Wesley Lee.

Nathan Janco, president, Centrifugal Casting Machine Co., Tulsa, Okla., was guest speaker and gave a complete description, with lantern slide illustrations, of the true centrifugal, semicentrifugal and centrifuge methods of casting. He described in detail the types of molds, rotating speeds, washes, metal savings and quality derived from this type of casting. He pointed out that before a job is to be cast centrifugally, it should be analyzed first to determine if it is practical or not to cast by this method. The main purpose in centrifugal casting is to increase yield by eliminating risers and decreasing metal failures. Therefore, saving would not be effected by producing normally high-yield commercial castings in this manner.

An interesting and lengthy discussion period followed the talk in which Mr. Janco answered questions from both the ferrous and nonferrous foundrymen present.—*R. W. Hathaway.*

St. Louis

FEB. 14 meeting of the St. Louis District Chapter of the AFA was held at the De Sota Hotel, with 155 members and guests in attendance. Chairman Walter E. Illig presided and announced the program for the March meeting. He called attention to the booklet on foundry sands and mold materials, published by the Northern California Chapter, copies of which may be secured at $2 each through that chapter. Chairman Illig also advised that the French engineers who are making a tour of American foundries would spend several days at the American Steel Foundries, East St. Louis. Walter Zeis, chairman of the membership committee reported the addition of four new members.

Lou Kleber, General Steel Castings Co., introduced the guest speaker, J. H. Van Deventer, editorial director of the *Iron Age*, whose subject was "Let's Release the Brakes." Mr. Van Deventer stated that no mythical formula by the administration would cure present conditions and the only cure would be effected by hard work and releasing the brakes. He brought out that since Pearl Harbor more than 2000 new products have been developed. Productivity has receded. In the steel industry, although wages have increased 36 per cent, production has increased only 9 per cent. The United States is rapidly approaching a civil war between management and labor over the share of "may-be" profits in the postwar period and we must get together to make profits, not by vacant plants, but by high production. A lively discussion and question period followed the address.—*Lee H. Horneyer, secretary-treasurer.*

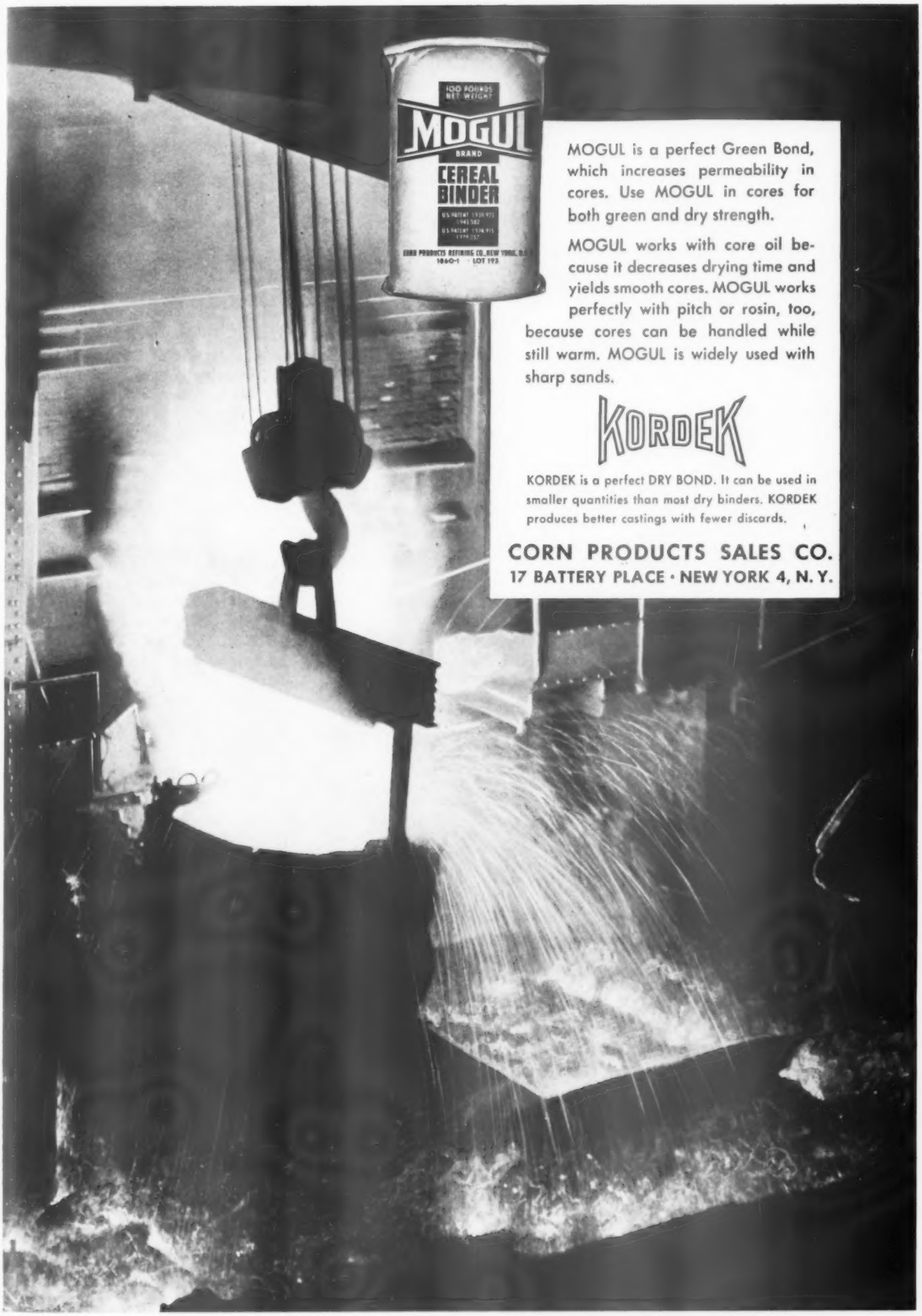
Northern California

FEB. 14 MEETING of the Northern California Chapter of the AFA, held at the Hotel Alameda, Alameda, Calif., was devoted to the subject of sand testing. Members were given an opportunity to preview an exhibition of sand testing equipment which had been brought to the hotel and set up especially for the meeting.

During and immediately following the dinner, Pete Valentine, sales manager of the sand department, Del Monte Proper-

(*Continued on page* 172)

BIRMINGHAM CONFERENCE: Candid shots taken during the recent 14th annual Regional Conference of the Birmingham District Chapter. Full details of the three-day meeting are presented elsewhere in this issue



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NORTHERN CALIFORNIA: Speakers' table at February meeting of Northern California Chapter, AFA. Left to right—John B. Morse, president, Del Monte Properties Co.; Richard Vosbrink, chapter vice president, Berkeley Pattern Works; Charles Hoehn Jr., chapter president, and plant manager, Enterprise Engine & Foundry Co.; Donald L. Mason, Stanford University, speaker; Andrew M. Ondreyco, program chairman, Vulcan Foundry Co.; Samuel D. Russell, national director, AFA, Phoenix Iron Works Co. (Photos courtesy Enterprise Engine & Foundry Co.)

(*Continued from page* 170)

ties Co., gave a most enjoyable program of vocal and instrumental music. He was accompanied by his special guests, Henry Sinigiani, Sherman Clay & Co., San Francisco, and James Muir. A surprise visitor was Mrs. Muir, who became "Madame Zurka" in a baffling mental telepathy act with her husband. The show drew much enthusiastic applause. The entire membership participated in many request numbers. National Director Sam Russell was presented with a beautiful necktie for his rendition of "Roll Out the Barrel," by popular demand.

Chapter President Charles Hoehn Jr. introduced the visitors at each table and welcomed back into the chapter Jim Francis who has spent the last several years in the East and in South America. President Hoehn also announced the formation of the new Educational Committee with Sam Russell, Phoenix Iron Works, as chairman, reiterating his previous admonition to foundrymen, "clean up your shops," to hold present employees, attract desirable young men and improve safety and efficiency.

Program Chairman Andrew M. Ondreyco then introduced Donald L. Mason, instructor in foundry practice at Stanford University, who conducted an interesting demonstration of sand testing equipment and methods. Mr. Mason pointed out that the foundry industry had come a long way from the old processes of feeling, tasting, smelling and blowing through sand to test its suitability for making molds. Each piece of apparatus was described and its function explained by actual demonstration. Mr. Mason also covered in an interesting manner the practical application of results obtained from the various tests made.

A question and discussion period followed the demonstration during which a panel of sand committee members, headed by George Stewart, chairman, took part. Some of the subjects discussed included the place of the microscope in the study of sand grain arrangement and analysis of casting defects; "buckles" and "scabs"; sand testing equipment the small foundry should have; and the design and

Don Mason, Stanford University, demonstrates sand testing equipment before Northern California Chapter, AFA

use of a small 2500 F oven furnace for testing cores for heat shock, spalling, etc. Mr. Dalbey of Mare Island Navy Yard stated that they often use a crucible furnace for this purpose, first heating the furnace to the desired temperature, shutting off the fire, then lowering the sample down into the furnace.

Mr. Mason distributed mimeographed copies of an outline of his talk, including several interesting charts showing interrelationship of moisture, permeability, strength for various molding sands and effects of mulling and ramming as related to various properties. These were supplied through courtesy of the Enterprise Engine & Foundry Co. — *Charles R. Marshall, publicity chairman.*

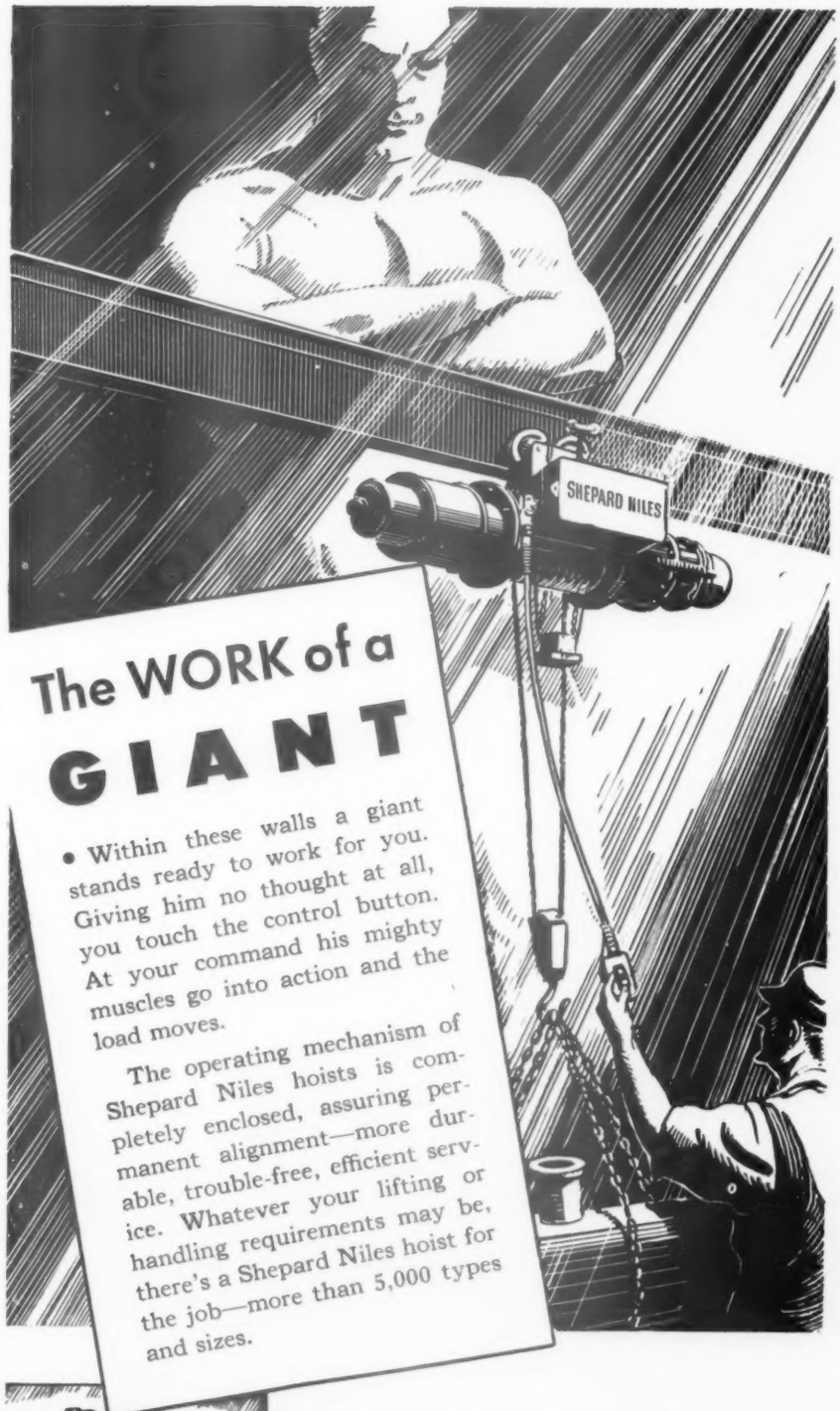
Northeastern Ohio

INTERESTING program presented at the Feb. 14 meeting of the Northeastern Ohio Chapter of the AFA at the Tudor Arms Hotel, Cleveland, included observations of a returned military officer on life in the South Pacific, and an eminently practical talk on the subject of centrifugal casting.

Richard McNelly, a veteran of World War I, entered the Army in 1940 with the 37th division as artillery officer and recently was discharged with rank of colonel as commander of the 637th tank destroyer battalion. He devoted most of his talk to a eulogy of the natives of the Fiji Islands, an inherently honest, sincere, kindly and courteous people and not at all the wild, head-hunting, cannibalistic savages usually pictured in the minds of people who never have seen and never expect to see this interesting part of the world.

Nathan Janco, president, Centrifugal Casting Machine Co., Tulsa, Okla., and consulting engineer on centrifugal casting to a number of large foundries in the United States and Canada, has had wide experience in the design of suitable molds used in the centrifugal casting of ferrous and nonferrous metals. His talk was illustrated with many slides showing typical castings, also charts and formulas for calculating pouring speeds, machine speeds and other features in connection with this method of producing castings.

Following a general reference to the process and its wide acceptance in cast iron pipe foundries, he pointed out that the subject might be considered under three headings: True centrifugal, semi-centrifugal and centrifuge. True centrifugal castings, in which directional solidification is an important feature, include tubes, bushings, bearings, flanges, gear blanks, etc. Castings which lend themselves readily to the semi-centrifugal method, with or without gates, include sheaves, gears, miscellaneous shapes. In the centrifuge method a number of dupli-



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cate castings, or several items of a miscellaneous group are arranged around a common center. Various types of molds are employed including all metal molds, dry sand molds oven dried in flasks, dry sand molds oven dried in form of cores, air dried cores, and green sand skin dried in flasks.—*Pat Dwyer.*

Twin City

LITTLE grains of sand were made mighty important at the January meeting of the Twin City Chapter of the AFA, held in the cafeteria of the American Hoist & Derrick Co., St. Paul, by Adrian C. Den Breejen, Hydro-Blast Corp., Chicago, when he spoke on "Practical Foundry Sand Problems." The talk was illustrated with colored slides showing various sands after a wide range of different treatments.

Mr. Den Breejen pointed out that foundry sand, whether for cores or molds, is just silica grains with iron oxide or clay for hot binder and cereal or oil or resin for cold binder, plus a minimum of moisture and impurities. In discussing various sand mixtures it was pointed out that definite limits should be observed, depending on the type of sand used, and each has its various limitations. For instance, cold binders and water should be so restricted as not to give off more gas than the sand porosity and venting will relieve.

Casting finish is roughly a function of the coarsest constituent in the sand, and gas porosity is a function of the finest constituent. Sand therefore should be opened up by removing the fines, rather than by adding so-called open sand. Sand that will pop when heated on a hot plate will generate a lot of fines in service and is not suitable for repeated use.

The speaker stated that molding sand that will "boil" appreciably when wetted with 5 per cent solution of hydrochloric acid has too much calcium carbonate for sound casting. The accumulation of calcium carbonate in sand from continued wetting down with hard well water may give rise to this defect. He said that St. Peter sandstone, like Minnesota sand, is in general an excellent base for foundry sand. A sand system should remove fines and wash the sand grains of excess bonding material and still leave some clay and natural bond on the sand grains to reduce the requirements for new bonding additions. Only a continuous sand conditioning system with a stable grain sand can maintain uniform conditions.

The American Hoist & Derrick Co. was host for this meeting and in spite of the meat shortage the meal consisted of plenty of ham and all the trimmings. J. C. Horner, plant engineer, and H. M. Patton, vice chairman of the chapter, made the members and guests feel really welcome and invited them to come again. —*J. W. Costello.*

Eastern Canada and Newfoundland

REGULAR monthly meeting of the Eastern Canada and Newfoundland Chapter of the AFA was held Feb. 8 at the Mount Royal Hotel, Montreal. The program consisted of group discussions, this being the second of such meetings proposed for the season. That this type of meeting is extremely popular is attested to by the fact that the largest number ever to attend the group meetings was present. Further proof is shown by the great interest which is displayed in the discussion period which follows the short, informal papers.

The iron and steel section was under the chairmanship of J. Grieve, Dominion Engineering Works Ltd. Discussion leaders were W. Bradley, Dominion Engineering Works Ltd., who spoke on "Pressure Feeding Iron Castings," and W. T. Shute, Canadian Car & Foundry Co.

(*Continued on page* 176)

AT ALAMEDA, CALIF.: (Right)—View of gathering at February meeting of Northern California Chapter, AFA. (Left below)—Music was furnished by Henry Sinigiani (accordion) Sherman Clay & Co.; Pete Valentine (guitar) Del Monte Properties Co., and Jimmy Muir (horn). (Right below)—Jimmy Muir arranges a new coiffure for Sam Russell, Phoenix Iron Works Co. (Photos courtesy Enterprise Engine & Foundry Co., San Francisco)

DESPATCH OVEN No. 19674

40% more cores with lower baking costs!

HERE'S the straight-line DESPATCH layout that got these results!

"Boosts production 40% . . . absorbs rising coremaking costs . . . bakes ½ lb. to 300 lb. cores at same time . . . eliminates burnt or green cores . . . hasn't cost us a cent for maintenance . . . BEST INVESTMENT WE EVER MADE!"

These are recent comments by a midwest foundry superintendent after this vertical conveyor-type DESPATCH Core-Baking Oven completed 3 years of trouble-free service, including heavy war production.

"In spite of a marked increase in overall foundry production costs," the superintendent said, "the efficiency of straight-line core and mold production with this speedy oven has *held our coremaking costs down to pre-war levels.*"

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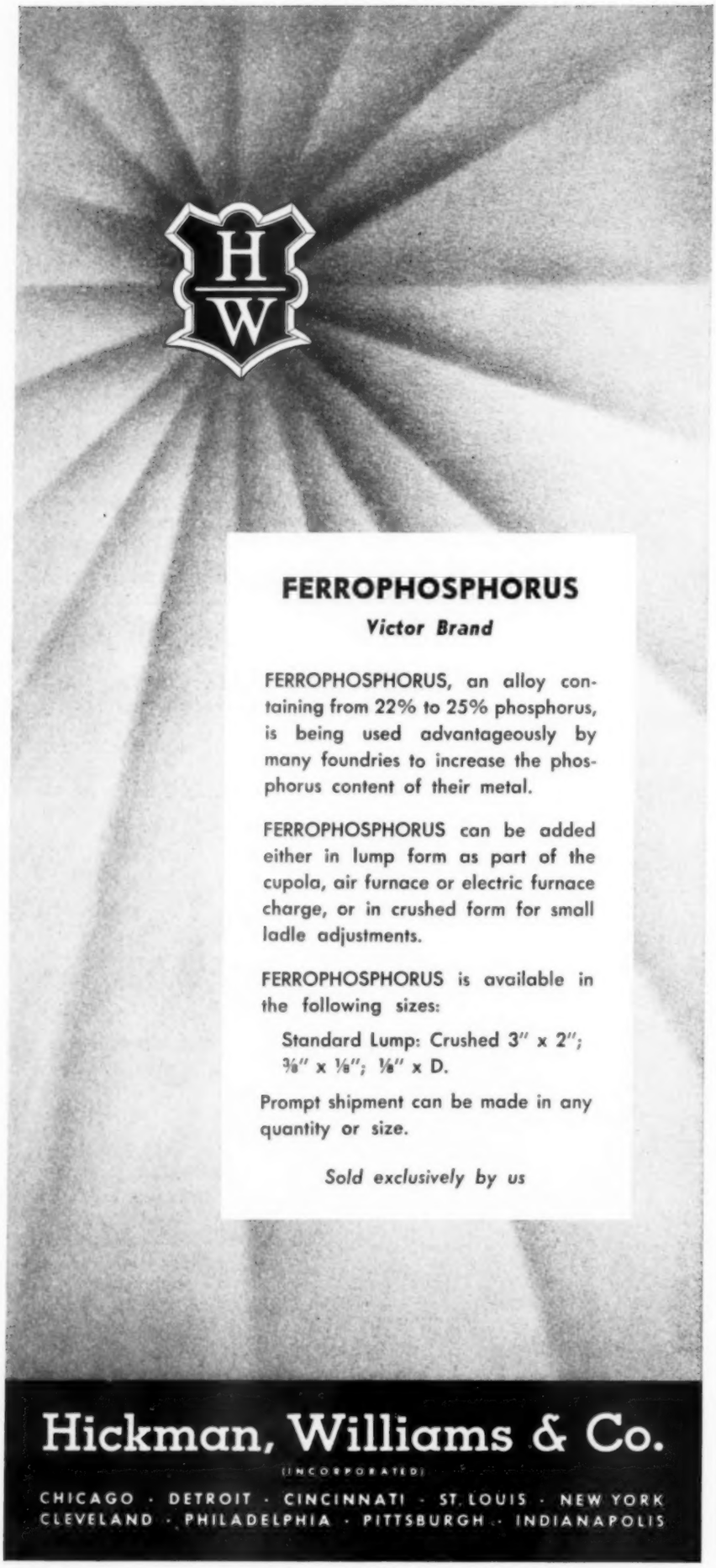
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FERROPHOSPHORUS, an alloy containing from 22% to 25% phosphorus, is being used advantageously by many foundries to increase the phosphorus content of their metal.
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(*Continued from page* 174)

Ltd., whose subject was "Pressure Feeding Steel Castings."

The nonferrous group was under the direction of A. J. Moore, Montreal Bronze Ltd. Discussion leaders were H. W. Bennett, Dominion Engineering Works Ltd., who spoke on "Gates and Risers," and C. J. Converse, Crane Ltd., whose subject was "Sand Control in the Bronze Foundry."

W. Seeds, Western Pattern Works, was chairman of the third group, and the speaker was C. C. Brisbois, Robert Mitchell Co. Ltd. Mr. Brisbois discussed "Composition Matchplate Patterns."—*G. D. Turnbull, publicity chairman.*

Central Ohio

FEB. 25 meeting of the Central Ohio Chapter of the AFA, at Columbus, had B. P. Mulcahy, Citizens Gas & Coke Utility, Indianapolis, as principal speaker. Mr. Mulcahy, with the aid of slides, pointed out that the cupola charge is melted by the gases, and not by direct contact with the coke. He showed how the direction of gases traveling up the cupola, in conjunction with the amount of air used, affected the melting requirements.

In pointing out the importance of coke size in controlling many factors, Mr. Mulcahy described the industry's efforts in regulating the size of coke.—*Karol W. Whitlatch, secretary.*

Canton

RECOGNITION of the service records of various foundrymen of the area featured the Feb. 21 meeting of the Canton District Chapter of the AFA.

Pins signifying 50 or more years of service in the foundry industry were presented by the chapter to the following: John Ward and Frank Lang, American Steel Foundries, Alliance, O.; Ed Fletcher, Harry Wisner, John Boyle, William Devine, Harry Towns, William Apgar and John Barnett, Machined Steel Castings Co., Alliance; George Hunter, Fred Leedham, Tom Betz and Robert Hug, United Engineering & Foundry Co., Canton, O.; John Bellinski and Theodore Dubs, Canton Pattern & Mfg. Co., Canton; William Potts, William Mullet, Charles Geiger, Ollie Shaeffer, the Deming Co., Salem, O.; Charles P. McCafferty and Watson Johnson, the Pitcairn Co., Barberton, O.; John Bonnot and Cyrus Jackson, the Bonnot Co., Canton; Alfred Vose, Union Metal Mfg. Co., Canton, and Christian Kratt, Lectromelt Steel Castings Co., Barberton.

Following the dinner moving pictures of the 1945 picnic held at the country home of Otis D. Clay were shown.

Roundtable discussions completed the

program, with the following as group leaders: Cast iron, C. W. Traynor, Union Metal Mfg. Co., Canton; Steel, Carl Fornwalt, Atlantic Foundries, Akron; Patternmaking, George W. Simes, American Steel Foundries, Alliance; Nonferrous, Charles McCafferty, the Pitcairn Co., Barberton; Time and motion study, Millard B. Hoffman, Norris Elliot Co., Columbus.—*Nils E. Moore, reporter.*

Northwestern Pa.

REGULAR monthly meeting of the Northwestern Pennsylvania Chapter of the AFA was held Feb. 25, at the Moose Club, Erie, with approximately 100 members and guests in attendance. Tom E. Barlow, Battelle Memorial Institute, Columbus, O., guest speaker, gave a clear, concise talk on "Sound Cupola Practice."

Mr. Barlow described general conditions prevailing in most plants where cupolas are in operation and criticized the fact that this most necessary tool in the foundry industry has been much neglected as far as standard practice is concerned. Two cupolas of identical construction should be operated in the same way, but the speaker stated they frequently are operated differently because they have not been carefully analyzed as far as piping and general hookup are concerned. Using simple drawings on a blackboard, the speaker demonstrated the daily operation of the cupola so that the subject was thoroughly understood by all his listeners. Kenneth Guyer, Cascade Foundry, Erie, led the discussion period which followed the talk and all present felt that it was one of the best presentations that have been given before the chapter.

63 YEARS: Canton District Chapter President H. G. Robertson, American Steel Foundries, Alliance, O., presenting service pin to John Bonnot, the Bonnot Co., Canton, O., in recognition of the latter's 63 years of service in the foundry industry. Mr. Bonnot had the longest service record of various foundrymen honored recently by Canton District Chapter

Douglas James, Erie City Iron Works, chairman of the local foundry exhibit to be held at the Erie Y. M. C. A. the latter part of May, gave a resume of committee activities up to the present time. The exhibit has the co-operation of the Erie Foremen's Association, which feels that the shortage of castings is one of its own problems and the primary object of the exhibit is to interest young men in the foundry industry. Earl M. Strick, Erie Malleable Iron Co., vice chairman of the chapter, presided at the meeting.

The Venango group of the chapter held a meeting Feb. 18 at the Arlington Hotel, Oil City, at which J. E. Gill, Lake Shore Pattern Works, Erie, addressed a group of about 45 members and guests on "Patterns for Production." The speaker presented a comprehensive picture of various types of patterns and gating for different types of metals and many ques-

(*Continued on page* 180)

SERVICE RECORD: Foundrymen of the Canton, O., area who received 50-year service pins from the Canton Disrtict Chapter, AFA, and the number of years of their association with the foundry industry: Front row, left to right—Tom Betz (57), George Hunter (53), Cyrus A. Jackson (51), John Bonnot (63), Ed Fletcher (51), John Bellinski (51), Harry Towns (50), William Devine (54). Back row, left to right—Fred Leedham (56), William Potts (58), Robert Hug (54), Theodore Dubs (54), John Boyle (52), Harry Wisner (51), Alfred Vose (55), Watson Johnson (53), Charles P. McCafferty (53). Not present—John Ward (53), Frank Lang (54), William Apgar (50), John Barnett (53), William Mullet (52), Charles Geiger (55), Ollie Shaeffer (59), Christian Kratt (52)

"Slingers"! HERE'S WHAT WESTINGHOUSE THINKS OF THEM!

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Feeder Division
EAST PITTSBURGH, PA.

January 8, 1946

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Gentlemen:

The 1945 Christmas issue of your "Better Methods" magazine was of distinct interest to us, the operators and workmen of the Westinghouse Foundry, located at Trafford, Pennsylvania. We feel that you and your staff performed an excellent job in describing, both in words and pictures, the foundry facilities now in use at Trafford.

The "round-the-clock" performance of this equipment during the war emergency indicates to us that we may anticipate obtaining the same satisfactory results during the reconversion period.

We find that the adoption of Sandslingers, together with the installation of the necessary sand handling and mold conveying equipment, permits a jobbing foundry, such as ours, to use mechanical means for the production of castings weighing from five pounds to one hundred and seventy-five thousand pounds. Our experience further indicates that Sandslinger molding units are also extremely flexible from the standpoint of pattern equipment, flasks, and personnel, thereby allowing us to meet the varying demands for grey iron castings used by the Westinghouse Electric Corporation.

We sincerely appreciate the favorable comments accorded us regarding our operations, and take this opportunity to wish you continued success in furnishing the foundry industry with live and up-to-the-minute articles on the art of making better and cheaper castings.

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A variety of Sandslinger types are used at Westinghouse—which illustrates the advantages of specialization in mechanical ramming for particular jobs. It proves also that there is a Sandslinger model exactly suited to *your* requirements—whether your foundry is large, medium or small.

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One of the four Stationary Sandslingers at Westinghouse's Trafford Foundry.

Double Stationary Sandslinger unit is serviced by an indexing Rollover machine for drags.

Stationary Speedslinger quickly rams large and medium size molds.

This Locomotive Sandslinger was one of the first purchased by Westinghouse—still in excellent condition!

The high-speed molding unit featuring the amazing Swingslinger.

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(*Continued from page 177*)

tions about patterns were answered by him in the subsequent discussion period. T. M. Beaulac, Chicago Pneumatic Tool Co., Franklin, presided and led the discussion. These meetings of the Venango group have been so enthusiastically received that a third meeting was announced to be held during March.

Larry Dunn, General Electric Co., Erie, and Earl M. Strick attended a meeting held Feb. 28 at the Academy High School, Erie, when J. E. Jeffries, technical vocational director of the Erie school district, addressed a large group of young men preparatory to the inauguration of the new foundry classes which have been added to the school's list of accredited subjects, beginning with the fall semester. It is felt that the foundry industry should benefit greatly by this new program which is sponsored by the Northwestern Chapter.—*Earl M. Strick, reporter.*

Philadelphia

FEBRUARY meeting of the Philadelphia Chapter of the AFA was well attended. John Robb Jr., chapter chairman, presided and reported to the membership on committee activities, making special mention of the progress of the educational lecture series being given at University of Pennsylvania.

Charles Mooney, Olney Foundry Division of Link Belt Co., acted capably as technical chairman. The technical address was given by E. C. Troy, Dodge Steel Co., whose subject was "Core and Molding Sands." Mr. Troy pointed out the inadequacy of present day sand control programs, since they are based on day-to-day results instead of seeking necessary and desirable properties. Such practices will continue until the basic principles involved in sand compounding are found through research.—*L. Lane.*

Ontario

THE subject of "Gating and Risering —Ferrous and Nonferrous," was discussed in a very interesting and instructive manner by H. F. Taylor, Naval Research Laboratory, Washington, at present on leave of absence to study at Massachusetts Institute of Technology, at a meeting of Ontario Chapter of the AFA in Toronto, Feb. 22.

Rather than cover the field of gating and risering generally, the speaker concentrated on a few major developments. In introducing these, he pointed out that soundness in a casting is relative and a sound casting is very often defined in terms of one that will do a certain job satisfactorily. In his talk he pointed out that sound castings for the purposes of the discussion would be ones proved sound by every accepted method of test.

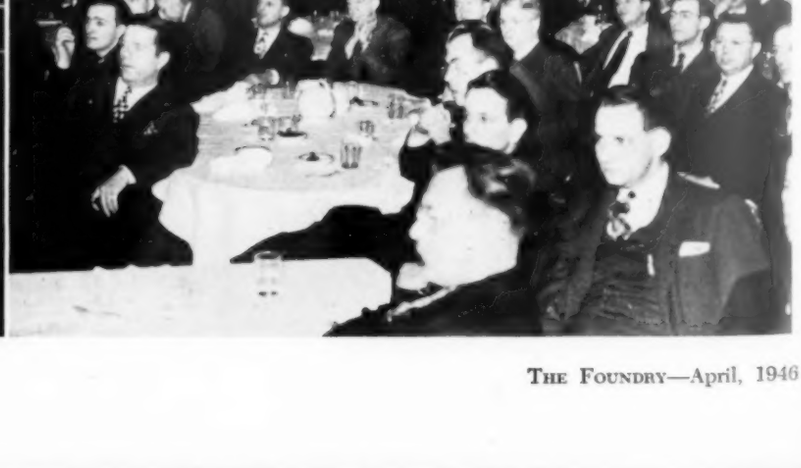
In work directed toward the reduction of the size of risers and making them more effective, one line of approach was to find an insulating material that would keep the riser hot. Gypsum metal casting plaster was found to be very effective. In a comparative test, the length of time which metal kept fluid was nine minutes with the gypsum plaster and four minutes with sand. Fluidity spirals also gave results two to one in favor of gypsum. Using this gypsum insulation for the risers, their size could be cut down. In one case it was possible to use, with the gypsum, a riser 25 per cent the size of the original riser. The speaker described a number of castings on which the weight of risers had been greatly reduced by using gypsum insulation.

Because of its sulphur content, gypsum cannot be used with castings in iron or steel. So far no cheap and efficient insulators for iron and steel castings has been found.

The speaker discussed briefly the use of exothermic materials to maintain fluidity in risers, in iron and steel castings. In studying these exothermic materials, it was found that their addition to the top of risers was a failure. Addition at this point did not get the heat to the place where it was really needed and practice had to be modified to keep the riser fluid at the point where it feeds to the casting.

Other developments discussed included knock-off risers. This type of riser had not been used in steel in the United States prior to the war but now the practice is being applied on both large and small risers and a good deal of money is being saved through reduced work in riser removal. Reference was also made to the importance of atmospheric pressue in securing proper feeding of castings. By utilizing atmospheric pressure, castings in steel are produced higher than the

PHILADELPHIA: Scenes at the February meeting of the Philadelphia Chapter, AFA, at which E. C. Troy, Dodge Steel Co., gave the technical address. Shown below, left to right, are Chapter Chairman John Robb, Hickman, Williams & Co., and Bert Troy



risers feeding them. This is not possible in nonferrous castings.

The meeting was under the chairmanship of T. D. Barnes, Don Barnes Foundry Supplies & Equipment, Hamilton, The speaker was introduced by J. Dalby, Wilson Brass & Aluminum Foundries Ltd., Toronto, and a spirited discussion was good evidence of the interest of the audience.—*G. L. White, secretary.*

Chicago

MEANS by which the foundry can achieve dimensional control of sand castings proved a topic of much interest to members of the Chicago Chapter of the AFA at their regular meeting on Mar. 6. Under sponsorship of the Pattern division, A. F. Pfeiffer, pattern and foundry division, Allis-Chalmers Mfg. Co., Milwaukee, was the speaker.

At this meeting, held at the Chicago Bar Association, the chapter was host to six members of a French foundry group visiting foundries and industrial plants in the United States. These guests included Paul de Rosiere, Fonderies de Creil, Paris; Jacques Bardou, S.A.M.P.A., Paris; Hubert Cromback, Acieries Thome Cromback, Paris; Jean Gustin, Ets. Gustin Fils, Deville, Ardennes; Pierre Maillat, Ets. Guiot, Neuilly, Seine; and Jean Martiny, Fonderies Jean Martiny, Mont-Saint-Aignan.

Speaking on behalf of the delegation, Mr. de Rosiere expressed appreciation for the American hospitality extended to it on its visit, and explained the purpose of the mission was to learn of new methods and equipment which would assist French foundries in their rehabilitation. With plants deteriorated and damaged from German occupation, casting production is far below prewar, but is rising slowly.

In the absence of Chapter President J. C. Gore, Vice President Lawrence H. Hahn, metallurgist, Sivyer Steel Casting Co., Chicago, presided. Following dinner, an interesting musical program was provided by "The Chanters," a 20-voice male chorus from Orak Temple, Order of the Mystic Shrine, Hammond, Ind. The group is directed by James Thomson, works engineer, Continental Foundry & Machine Co., East Chicago, Ind., a veteran active member of the Chicago Chapter.

Technical portion of the program was presided over by Harry J. Jacobson, proprietor, Industrial Pattern Works, Chicago, and chairman of the Pattern division. In introducing Mr. Pfeiffer, Mr. Jacobson pointed out if scrap in the foundry is to be held low, it is essential that castings be internally sound and dimensionally accurate. Through many year's experience with patterns and found-

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SAND PREPARATION TIME 50%

"A 50% cut in our core sand preparation time with the Mulbaro! That's a real saving!" say officials of the Milwaukee Flush Valve Company, Milwaukee, Wisc. "What's more, the Mulbaro has paid for itself in oil savings alone in less than a year, due to more thorough, more uniform sand mulling which meets our exact molding requirements." Foundries, large and small, use the Mulbaro for facing and backing as well as core sand.

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Mulling unit is lowered onto barrow with a hoist. Required amount of oil is added and within a few minutes, sand is completely mulled.

Mulled sand is now moved away to molding machines; another barrow of sand is placed under mulling unit.

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The Tessmer saves man-hours and cuts labor costs because it does away with slow, tedious hand operations. One swift, sure stroke of the tool-steel cutting knives clips off non-ferrous gates and sprues in a matter of seconds. Highly skilled labor is not required as any workman can run one of these machines at top capacity in short order.

New models of the Tessmer Sprue Cutter, featuring postwar improvements in performance and construction, are now in production. Write for complete description and specifications . . . and arrange to increase the efficiency of your cleaning department.

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ry practice, he said, the speaker had achieved recognition as an authority on these two matters.

In his address, Mr. Pfeiffer convinced the audience that the chairman's introduction was accurate A profusion of slides indicated his experience covered castings weighing from a few pounds upward to tons. When patterns are to be purchased, he recommends that bidders be furnished a standardized estimate sheet on which all specifications are stated clearly. This will simplify estimating of costs and all bidders will be working to the same specifications.

Mr. Pfeiffer also recommended that insofar as possible castings be produced with standard equipment and foundry procedure. In other words, avoid special methods. In the case of complicated patterns and coreboxes, money can well be spent to make working models to illustrate assembly. Workers thus can visualize how the finished job should look and how the work assigned to them fits into the whole. When production runs are large, cost of models is easily absorbed.

Chicago Chapter held its annual Ladies' Night party at the Stevens hotel on Feb. 23 with an attendance of about 350 couples. In the hands of a capable committee, the event matched those of previous years. Edward J. Cullinan, salesman, Western Foundry Co., is chairman of the entertainment committee, and Harry E. Cullen, director of recreation, South Works, Carnegie-Illinois Steel Corp., is secretary.—*Erle F. Ross.*

Central New York

VICE Chairman E. E. Hook presided at the February meeting of the Central New York Chapter of the AFA, which was held Feb. 8 at the Onondaga Hotel, Syracuse, N. Y. After a brief business meeting Mr. Hook introduced Harold P. Gray, Gray Mfg. Co., Syracuse, the guest speaker, who presented the subject, "Precision Castings."

Mr. Gray is one of the pioneers in the investment molding field. Beginning with the work of Cellini, in the fifteenth century, he traced the history of the process down through the dental laboratory and manufacture of jewelry. Castings for industrial use were first manufactured in the early days of the war when General Electric Co. needed parts of an alloy that was almost impossible to machine.

When parts are needed for high strength steels that normally are difficult to machine, this process may be used to greatest advantage. However, even in complicated structures of low strength steels and nonferrous alloys, it is often possible to manufacture more economi-

(*Continued on page* 184)

We put a door in this brick

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--to show you some of the *PROVEN ADVANTAGES* behind the use of

Famous CORNELL CUPOLA FLUX

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Takes but a few seconds to use, saving time and labor.

Promotes accurate measurement—*correct use.* You simply toss one brick into cupola for each ton charge of iron or break off a briquette (quarter section) for each 500 lb. charge.

NO WASTE! Famous Cornell Brick Flux does not blow out with the blast—it STAYS in melting zone until entirely consumed.

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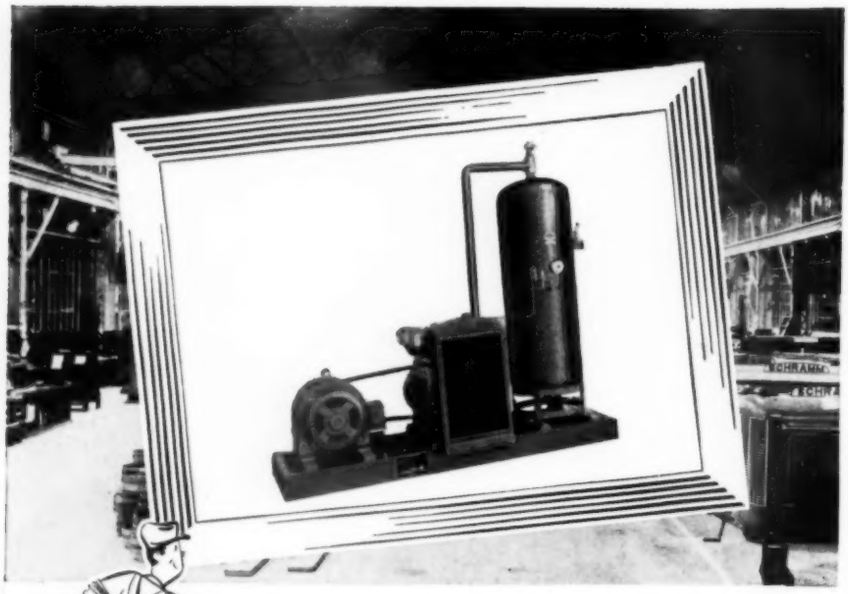
Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.



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Post-war industry will find many uses for the versatile Schramm Air Compressor. We invite you to write today for our new catalog and become acquainted with the construction features and details of the many Schramm models.

SCHRAMM INC. THE COMPRESSOR PEOPLE WEST CHESTER PENNSYLVANIA

(*Continued from page* 182)

cally than by machining or other casting methods.

The process consists of making wax patterns from molds that resemble the core boxes used in ordinary foundry work. These are embedded in a ceramic material held by a steel shell. The wax is melted and burned out and the molds are poured centrifugally while hot. The mold temperature varies, according to the alloy being poured. It may run as high as 1800 F. As yet, castings are limited in size, a mold of several pounds being the average.

The speaker presented a number of specimens of the wax patterns, molds in various stages of production, and castings both gated and finished. These created great interest and the speaker was called on to answer numerous questions at the conclusion of his talk.—*John A. Feola, reporter.*

Texas

REGULAR monthly meeting of the Texas Chapter of the AFA was held Feb. 15 at the Golfcrest Country Club, Houston. A. J. Edgar, technical advisor, Gray Iron Founders' Society, Washington, the guest speaker, presented an excellent and timely paper on "Correction of Foundry Waste."

Preceding his presentation Mr. Edgar gave a number of interesting facts concerning the gray iron foundry industry. According to War Production Board figures the production of gray iron castings during the period from January, 1942, to June, 1945, amounted to approximately 34,800,000 tons, a figure greater than the sum total of all engineering materials with the exception of steel.

Mr. Edgar stressed the importance of control of all foundry operations to eliminate waste. Careful weighing and use of correct quantities of materials will give maximum efficiency in cupola operation, eliminating direct waste and materially reducing losses from scrap castings. Control in the preparation of core sand mixes, particularly accurate weighing or measuring of sand, oil and binders, together with proper mixing, assures uniform cores with no waste of materials. Closer inspection of assembled cores prevents scrap losses. The speaker cited a case of high scrap loss from overlooking the thorough drying of a small core patch.

The right molding sand, correctly mixed, flasks and patterns in good condition, gates and risers designed for each casting, and high pouring temperatures are all factors that reduce waste in the molding department. On the subject of gates and risers, the importance of studying each job and applying basic

(*Continued on page* 186)

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MICHIGAN FOUNDRYMEN

To Hold Conference, April 5–6

REGIONAL foundry conference to be held at Michigan State College, East Lansing, Mich., Friday and Saturday, April 5-6, will include a full two-day program of technical discussions, with a dinner meeting Friday evening. In addition to Michigan State College, four Michigan chapters of the American Foundrymen's Association are participating in sponsorship of the meeting. This will be the ninth foundry conference to be held at the school and will mark a resumption of the annual gatherings which were suspended after 1940 by the war.

A committee, headed by C. C. Sigerfoos, School of Engineering, Michigan State College, as chairman and including the following chapter representatives, prepared the program: Saginaw Valley Chapter, J. F. Smith, Chevrolet Gray Iron Foundry, Saginaw; Michiana Chapter, M. F. Surls, Clark Equipment Co., Buchanan; Detroit Chapter, Fred Wagner, Centrifugal Fusing Co., Lansing; Western Michigan Chapter, R. W. Hathaway, Federal Mogul Corp., Greenville; Michigan State College, H. Womochel and Dean H. B. Dirks.

Chairmen of the four co-operating chapters will act as chairmen of the four technical meetings, all of which will be held in the R. E. Olds Engineering building.

The complete program follows:

Friday, April 5

Chairman: W. V. Johnson, Oliver Farm Equipment Co., South Bend, Ind.

9:30 a.m.—Address of welcome, Prof. L. G. Miller, head of Mechanical Engineering Department, M.S.C.

10 a.m.—"Foundry Control Methods and How They Save You Money," by H. W. Dietert, Harry W. Dietert Co., Detroit.

11 a.m.—"Precision Castings," by W. A. Morey, formerly with Chicago Ordnance District.

Chairman: J. F. Smith, Chevrolet Gray Iron Foundry, Saginaw.

2 p.m.—"Relative Effect of Lime and Dolomite Fluxes on Cupola Irons and Cupola Operation," by H. Womochel and C. C. Sigerfoos, Mechanical Engineering Department, M.S.C.

3 p.m.—"Recent Developments in Making Malleable Castings," by Carl Joseph, Saginaw Malleable Iron Division, Saginaw.

4 p.m.—"Control of Steel Casting Defects," by Howard Taylor, Massachusetts Institute of Technology (on leave from Naval Research Laboratory).

7 p.m.—Dinner meeting, Olds Hotel, Lansing. *Chairman,* L. G. Miller, Mechanical Engineering Department, M.S.C. Entertainment by Prof. J. G. Hays, Dairy Department, M.S.C. "Military Government Experiences in the Pacific," by Sam Street Hughs, former mayor of Lansing and lieutenant-commander in U. S. Navy.

Saturday, April 6

Chairman: E. C. Hoenicke, Eaton Mfg. Co., Detroit.

9 a.m.—"Attracting and Holding Foundry Workers," by Fred J. Walls, International Nickel Co., Detroit, and national president, AFA.

9:30 a.m.—"College Training of Foundry Engineers," by H. B. Dirks, dean, School of Engineering, M.S.C.

10 a.m.—"Foundry Health Hazards," by Dr. Markuson, director, Bureau of Industrial Health, Michigan Department of Health, Lansing.

11 a.m.—"Casting of Magnesium Base Alloys," by M. E. Brooks, Dow Chemical Co., Bay City, Mich.

Chairman: J. Wesley Lee, Challenge Machinery Co., Grand Haven, Mich.

1:30 p.m.—"Modern Trends in Pattern Rigging for Production Molding," by F. C. Riecks, Ford Motor Co., Dearborn, Mich.

2:30 p.m.—"Some Results Obtained on the Nature of Tool Wear and Power Required When Milling Various Types of Cast Irons," by Prof. O. W. Boston, chairman, Department of Metal Processing, University of Michigan, Ann Arbor.

3:30 p.m.—"Effect of the Mold on Cavity Defects in Gray Iron Castings," by C. C. Sigerfoos and H. Womochel, Mechanical Engineering Department, M.S.C.

(*Continued from page* 184)

rules for correct gating and risering was stressed.

Waste from breakage in the shakeout and cleaning departments is apparent, and instruction and supervision of inexperienced help was suggested as a means of holding such waste at a minimum.—*R. B. Mumford, publicity committee.*

Metropolitan

FEB. 4 meeting of the Metropolitan Chapter of the AFA was held at the Essex House, Newark, N. J., with 90 members and guests in attendance. Lester B. Knight, of Lester B. Knight & Associates, Chicago was guest of the chapter. The meeting was devoted to round-table discussion of melting practices.

The steel group, under the leadership of Carl Jernstrom, Cooper Alloy Castings Co., discussed the cause and elimination of pin holes in steel. It was agreed that a boil must be obtained and that superheated metal tends to increase the formation of pin holes and lower the fluidity.

The gray iron group, under the leadership of John Bukowski, Worthington Pump & Machinery Corp., discussed cupola operation. Considerable interest was expressed by the group in bed lighting and contuor patching of cupola lining. A lengthy discussion took place on air pressure and velocities of air through the cupola and its effect on melting and the product.

The light metals group, under the chairmanship of W. Wilson, Eclipse Pioneer Division, Bendix Aviation Corp., discussed the fluxing, degassing and grain refining of aluminum and magnesium. Interest was expressed in the use of gases for degassing and grain refining of magnesium, such as chloride and carbon tetrachloride, etc.

The copper base metals group, under the leadership of William Decker, Bethlehem Steel Co., discussed porosity in manganese bronzes and other high zinc metals. Time was devoted to a discussion of the substitution of nicked for tin in the tin bronzes and the melting problems attending this change.

Mar. 4 meeting of the chapter was held at the Essex House, Newark, with 75 in attendance. Chapter Chairman Horace A. Deane announced appointment of the following to serve on the nominating committee for the annual election: T. D. Parker, Climax Molybdenum Co. New York; J. Reed, R. Hoe & Co., Dunellen, N. J., and H. Harris, Mack Mfg. Corp., New Brunswick, N. J.

In the absence of M. E. Brooks, B. C. Harr, metallurgist, Dow Chemical Co., New York presented Mr. Brooks' paper on "Causes and Control of Porosity in Magnesium Alloy Sand Castings," illustrating the talk with slides. He stated the two causes of porosity in magnesium alloys are micro-shrinkage and gas. Micro-shrinkage may be caused by the gating and feeding practice and by composition of the alloy. An alloy composition having a narrow freezing range of about 200 F is desirable and the use of such a metal composition in place of one having a freezing range of 400 F will often eliminate porosity. In gating, care must be taken to avoid turbulence and for this reason bottom gating is necessary and to avoid the upsetting of directional solidification step and slot gates are provided. The sprue should be large as a rapid rate of filling the mold reduces porosity.

Presence of hydrogen gas in the metal aggravates formation of micro-shrinkage. Gas in the metal may arise from damp scrap, damp equipment and from the atmosphere under certain conditions. A good practice is to preheat the scrap before melting in order to drive off water. Care must be taken that equipment is dry before using. Gassy metal is always present when the atmosphere contains five grains of water per cubic foot of air. Carbon is used in various forms to eliminate gas and to refine the grain of magnesium alloys. The best method is to bubble carbon tetrachloride gas through the metal.

D. Frank O'Connor, American Saw Mill Machinery Co., Hackettstown, N. J., in speaking of the causes of porosity and other defects in bronzes and ferrous metals stated that to find the causes of defects in castings one should go to the foundry, to the foreman in charge of

(*Continued on page* 188)

JISCO Silvery—*In The Daily Diet*

Jisco is a prescribed "must" in modern foundry practice. It is a pure pig iron, produced from virgin ores and is physically and chemically clean. It has a high silicon content. Jisco, blended with your other melting stock assures these advantages—

Lower Costs . . . . Fine Grain and Uniform structure . . . . Easier Machineability . . . . Greater Strength and Toughness . . . . Less Internal Shrinkage . . . . Clean, Bright Castings, Free from Blow Holes . . . . Greatly Improved Foundry Operation.

From Andrew Jackson's Farewell Address to His Troops:

"I am at length enabled to perform the pleasing task of restoring to Tennessee, Kentucky, Louisiana, and the territory of the Mississippi, the brave troops who have acted such a distinguished part in the war which has just terminated. In restoring these brave men to their homes, much exertion is expected of, and great responsibility imposed on, the commanding officers of the different corps."

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You are invited to consult with us on any foundry problems you may have. There is no charge for this service.

THE JACKSON IRON & STEEL *Company*
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(*Continued from page* 186)

the work and to the man doing the work. Practices being used should be checked against the known correct practice. Most workers, if not checked, drift away from practices which are known to be right. This tendency causes defects in castings which may not be detected until they are machined and tested. A. V. Lorch, chief metallurgist, White Metal Rolling & Stamping Co., Brooklyn, N. Y., led the discussion which followed the two talks.—*C. J. Law.*

Cleveland

AT the Feb. meeting of the Patternmakers' Group of the Associated Industries of Cleveland, in the Cleveland Athletic Club, the members heard an animated discussion on the subject of plaster molds as applied to the construction of patterns. This was followed by a showing of a movie film in technicolor covering a recent hunting trip into Alaska headed by E. C. Kindt, president, Kindt-Collins Co., Cleveland.

George Gedeon, pattern shop superintendent, Aluminum Co. of America, and program chairman of the Patternmakers' Group, based his remarks on impressions received during a recent visit to the plant of the Briggs Mfg. Co., where precision castings are made in plaster molds. He cited several instances where the method could be applied to the production of patterns and corebboxes. In the original presentation and later during the discussion period he admitted that the method is not commercially applicable to the production of small quantities. It is distinctly part of a mass production program. The initial expense is heavy and is justified only in cases where the cost is absorbed by savings effected on long running jobs.

Replying to questions from the floor the speaker referred to details of method and material employed in making the plaster molds. Amounts of water and plaster are weighed accurately and mixed thoroughly. The molds are dried at a temperature of 700 F or over to remove every trace of moisture. A member pointed out that this high temperature could not be used on molds made up of a number of sections. At temperature over 500 degrees he claimed the mold would crack and the resulting castings would show shifts at the joints up to 1/64-in.

On the subject of applying a wash of some kind to the face of the mold, the speaker said it was impractical while the plaster was soft. The inquirer suggested that the coating material might be sprayed on the dried mold face. In the opinion of the speaker, the process has a distinct place in the foundry field, but the application is limited and the process never will displace the great majority of castings made in sand molds.

The moving picture of the Alaska expedition was extremely interesting and educational, and was accompanied by running comment by Norman Wagner, the official photographer.—*Pat Dwyer.*

Saginaw Valley

PRACTICAL Foundry Sand Problems" was the theme of the talk and discussion at the Feb. 7 dinner meeting of the Saginaw Valley Chapter of the AFA, at Frankenmuth, Mich. Adrian C. Den Breejen, Hydro-Blast Corp., Chicago, was the principal speaker.

Mr. Den Breejen, who is recognized as an authority on sand control and sand reclamation, pointed out that as a general rule, the best sand is usually the cheapest to use in the long run. He stated that in many cases the basic causes of sand troubles could be determined by two very simple tests that are often overlooked by foundrymen. The first consists of heating a sample of the sand to a red heat. The speaker cited cases in which sand undergoing such a test would pop like popcorn and break down, immediately indicating sand unsuited to foundry use. The second test consists of an acid test wherein foaming and frothing of chemical reaction gives an indication of the amounts of foreign chemical compounds, such as lime, etc., present in the sand, which affect its performance in the foundry.

Of great importance is the examination of the sand grains under a microscope. To illustrate what could be determined in this way, Mr. Den Breejen showed a number of lantern slides of miscellaneous sands, taken in color, and magnified fifteen times. As each was shown the speaker described the various grains and discussed the suitability of the sand for foundry work. A discussion period concluded the talk.

The coffee talk was presented by Martin Firth, chairman of program research, General Motors Institute, who described the development of personnel training.—*Joseph J. Clark, reporter*

Central Indiana

IN LINE with the present general unrest and uncertainty, the subject "Wage Incentives in the Foundry," was well received at the Feb. 4 meeting of the Central Indiana Chapter of the AFA. C. E. Westover, Westover Engineers, Milwaukee, presented the talk.

One of the principal phases of the subject, "Time and Motion Study," was well illustrated by the use of a film showing the operation of coremaking by a worker before and after proper training. Mr. Westover advocated the establishment of rates for each job and then the devising of incentive policies to permit going beyond the norm established. Walter Wingenroth, National Malleable & Steel Castings Co., Indianapolis, served as technical chairman and ably directed the discussion period into channels of general interest.—*B. P. Mulcahy, Historian.*

Southern California

EXPLAINING that 1028 castings are used in the Black Widow night fighter plane and that the castings weigh 845 pounds per plane or 5.54 per cent of the total weight, Tom Piper, materials and process engineer for Northrop Aircraft Inc., summarized his company's casting experience during the war in an address before the Southern California Chapter, AFA, Feb. 15, at the regular meeting in Los Angeles.

After a period of trial and error, he said, the setting up of a fluoroscopic inspection system eliminated 75 per cent radiographic inspection.

Experience with castings in wartime led the aviation concern management to the following conclusions, Mr. Piper told his audience:

Even though the casting technique is many years old, we are just now scratching the surface in producing quality castings and in controlling the product through X-ray inspection methods.

Before quality castings can be produced economically on an efficient basis a de-

(*Continued on page* 190)

CENTRAL INDIANA: C. E. Westover, Westover Engineers, Milwaukee, addressing recent monthly meeting of Central Indiana Chapter, AFA, at Indianapolis

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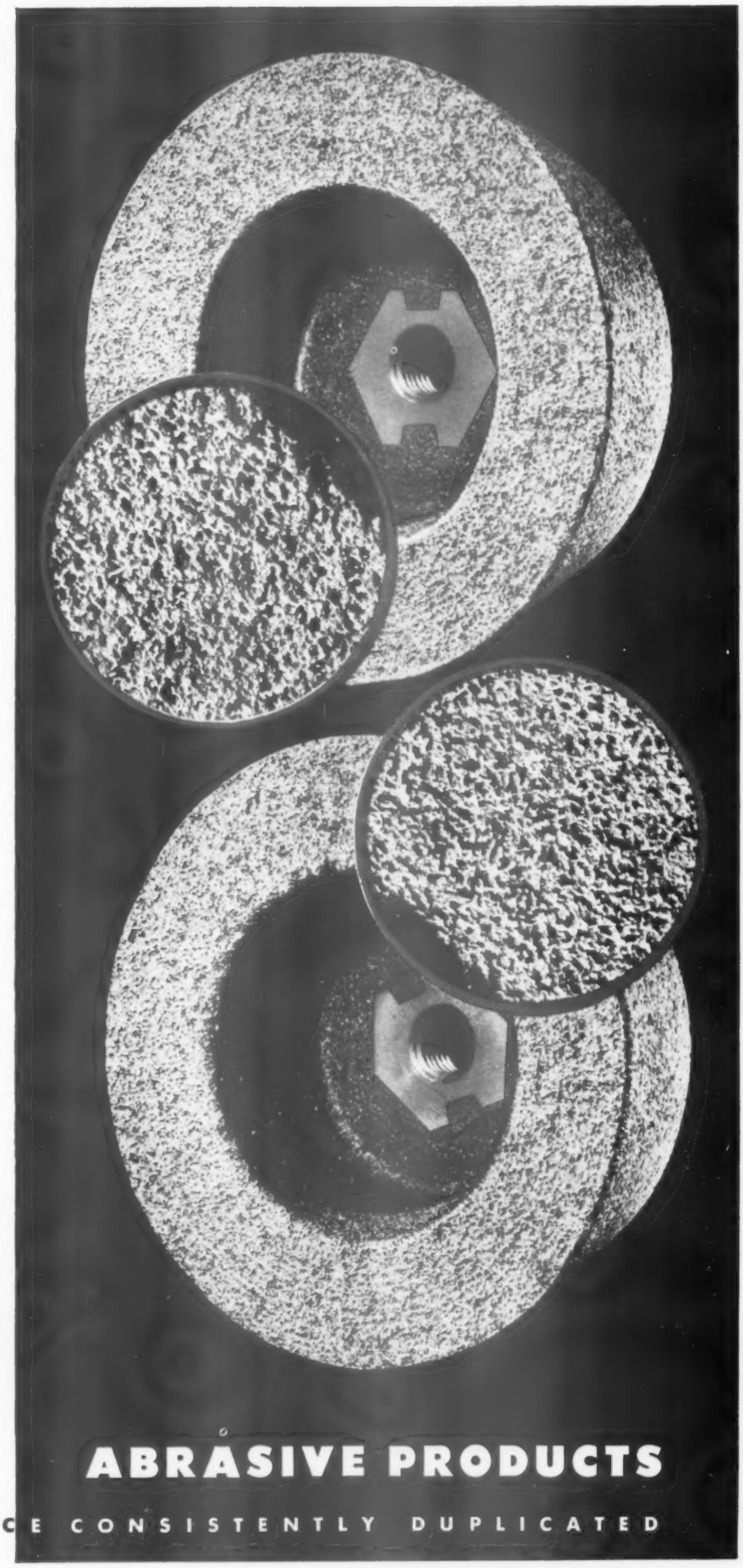

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(*Continued from page* 188)

velopment and research program must be undertaken to evaluate inherent irregularities and control them as far as possible by exact techniques.

Evaluation in the past has been difficult if not beyond the resources of many foundries. Aircraft castings were rejected by the thousands in the last few years because foundries had no means of proving to aircraft that apparently faulty castings were actually sound. Such lack of information is costly to foundries as well as the aircraft industry. By use of X-ray inspection methods, this difficulty can now be attacked successfully.

A second speaker at the meeting was Otto H. Rosentreter, assistant sales manager of the National Engineering Co., Chicago, who gave an exhaustive analysis of sand-handling equipment, illustrating his talk with lantern slides.—*James B. Morey, publicity chairman.*

Pittsburgh

PITTSBURGH Foundrymen's Association held its annual round-table meeting at the Fort Pitt Hotel, Feb. 18. Many questions dealing with operating problems in gray iron, malleable, steel and nonferrous foundries were discussed. As in the past the meeting drew a larger than normal attendance because of the greater mutual benefit for all members through group discussion of many and varied foundry operating problems.

Major topic of discussion dealt with ways and means of offsetting rising production costs under present OPA price ceilings. In this connection it was pointed out that some small foundries have been forced to shut down and will remain closed until OPA grants necessary price relief. Examples of mechanization of production and preparation lines, and how scrap loss was sharply reduced, were offered as partial remedies for foundrymen to combat steadily rising operating costs. Closely tied in with this was the question of how to get more production per man, with particular emphasis on wage incentive systems. One non-union foundry that paid union wage rates, was cited as being able to underbid its competitors primarily because of an incentive wage system it employs. Union opposition was said to be a major obstacle preventing most foundries from inaugurating incentive wage programs.

Other questions discussed covered many technical phases of foundry operations, including: Advisability of using spectroscope and x-ray diffraction methods for examining steel castings; procedure followed for reclaiming metal for repour after aluminum casting had been poured too hot; problem of taking car-

(*Continued on page* 192)

TAKE a *good* look at your scrap pile. If you find it full of partially machined castings . . . rejected after several hours of high-cost machining revealed harmful internal irregularities . . . radiography can do *plenty* for you.

You can save thousands of dollars by radiographing all parts requiring extensive machining. Balanced against savings in man-hours and machine time, radiography shows a profit!

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Right: Electrodes are controlled hydraulically from stationary pedestals which contain all automatic electrode and rocking controls for regulating melting speed, power input, and other melting factors. Transformers are installed beneath furnaces.

Left: Charging trucks are loaded on the scales in the metal room and elevated to the charging platform which separates two rows of three Detroit Electric Furnaces, installed back to back. Rear charging is accomplished quickly, eliminating congestion in front of furnaces.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

(*Continued from page* 190)

bon out of core dryers; precautions necessary to prevent sand clinging to patterns and coreboxes; procedure of deoxidizing and what deoxidizers should be used in steel melting; and whether or not brass should be melted in an open flame.—*Joseph C. Sullivan.*

Central Illinois

MONTHLY meeting of the Central Illinois Chapter of the AFA was held Feb. 18, at the Jefferson Hotel, Peoria, with Ed. Roby, chairman, presiding. The first speaker, Lloyd Ely, factory manager of Caterpillar Tractor Co., was introduced by Frank W. Shipley, program chairman.

Mr. Ely was chosen by the U. S. Corps of Engineers to go to Germany after VE-Day to check manufacturing methods of heavy construction equipment. The Germans did not have mass production that could compare with ours, although in some cases they had studied our methods at first hand in this country before being recalled to Germany.

The speaker noted that great differences exist between our system of apprenticeship as compared with that of Germany. In Germany, the father of the would-be apprentice pays to have the boy serve as an apprentice for a certain period of time. The apprentice must do everything that he is told to do. Mr. Ely told of numerous plants he visited and described methods and machines used in Germany.

E. W. Claar, service engineer, Eastern Clay Products Co., Eifort, O., chose "Synthetic Sand in the Small Foundry" as the subject of his address. He stated that synthetic sand is not a new subject, and sand is a subject of vital importance in every foundry, large or small. After defining synthetic sand, Mr. Claar gave the localities where the principal materials used in synthetic sand are found. He elaborated upon the 12 properties desired in preparing synthetic sand. It was Mr. Claar's opinion that every foundry needs some bonding clay at some time or other, because special jobs require different properties. Lack of mixing equipment is a definite handicap in many small foundries. By using combinations of clays, needed properties can be obtained and properties not needed can be eliminated.

Mr. Claar emphasized that production is increased with sand control and gave examples to support his statement. He said that every year we are learning more and more about sand and that the investigations being made by various organizations will develop much more information which will soon become common knowledge in all foundries.

These investigations, together with new ideas, are of benefit to the entire industry.—*Carl W. Wade, secretary.*

New England

REGULAR monthly meeting of the New England Foundrymen's Association was held Feb. 13 at the Engineers' Club, Boston, with 130 members and guests present. A short business meeting followed the usual dinner.

Matthew W. Potts, Eastern Industrial Sales Co., the guest speaker, gave an interesting paper on "Materials Handling." During the war Mr. Potts was assigned by the War Department to problems of handling of materials in factories, warehouses and shipping. He defined his subject as "the lifting or shifting of any material, regardless of its size, form or weight." Handling constitutes 85 per cent of production cost, he stated. The talk was supplemented by a sound movie which described proper methods of loading cars and ships, piling for storage purposes and transportation of various materials. A general discussion followed the address.—*Merton A. Hosmer.*

Connecticut

A LARGE attendance marked the regular monthly meeting of the Connecticut Non-Ferrous Foundrymen's Association, held Feb. 20 at the Hotel Taft, New Haven. Leo A. Behrendt, the Joseph Dixon Crucible Co., Jersey City, N. J., was the principal speaker, discussing "Recommended Practices for Crucible Use." An interesting period of questions and answers followed the talk.—*Louis G. Tarantino, secretary.*

Wisconsin

THE March monthly dinner meeting of the Wisconsin Chapter of the AFA was held on the 8th, at the Schroeder Hotel. Because of a blizzard, responsible for the "worst traffic jam in Milwaukee history," only 75 members were able to attend, out of several hundred expected. The speaker of the evening, Lester B. Knight, president of Lester B. Knight & Associates, Chicago, was 3 hours late in arriving, as he was snowbound at Beloit, near the Illinois border, but his talk on "The Foundry of Tomorrow" was worth waiting for. It was illustrated with slides, showing existing foundry installations.

While waiting for the speaker to arrive, a round-table discussion was held after dinner, with Robert C. Woodward, Bucyrus-Erie Co., presiding. The discussion was opened by Fred A. Pampel,

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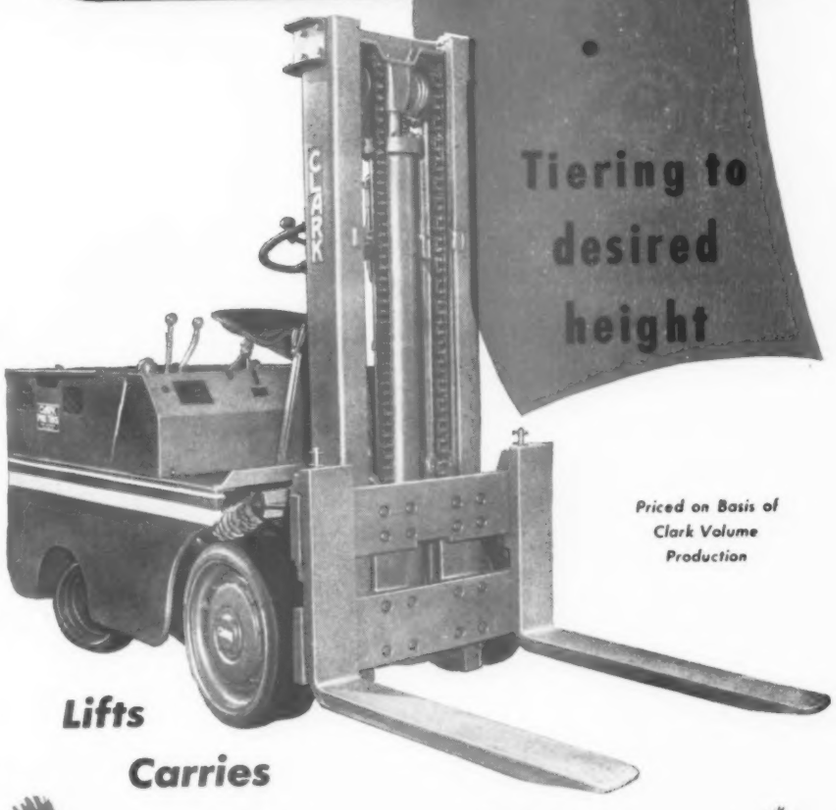

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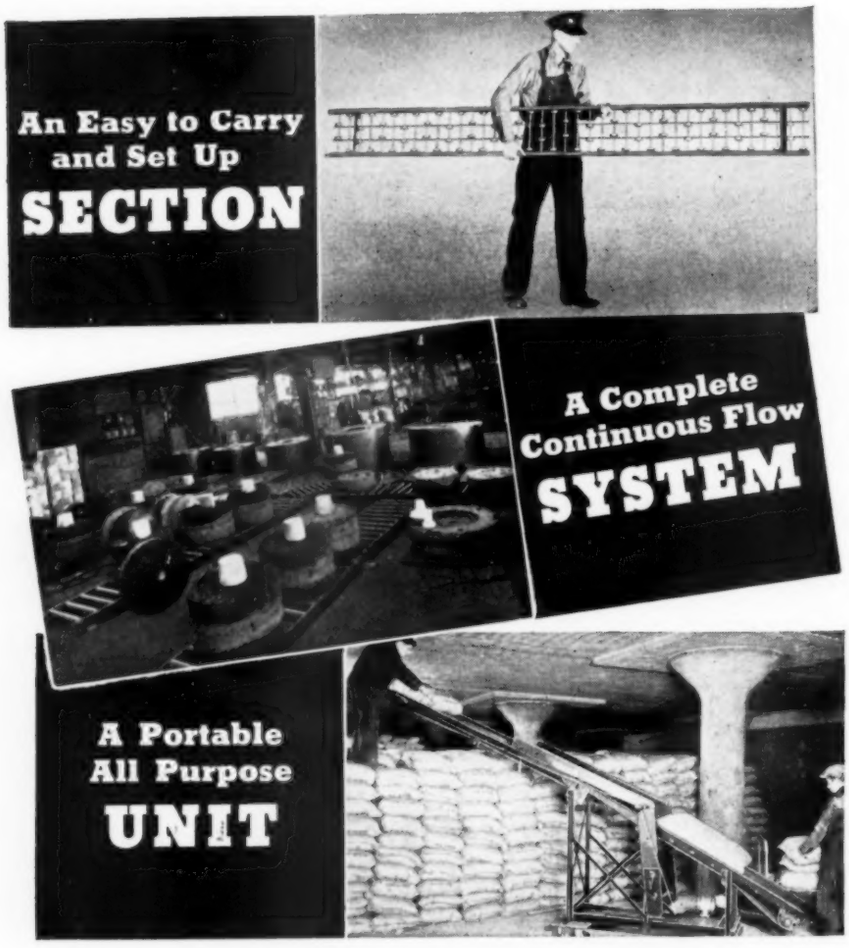

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Chain Belt Co., on present-day foundry equipment, with many comments from the floor. Roy Bennett, Netronite Co., had foundry sand for his subject, and he answered numerous questions regarding various mixtures.

Among the members present at the meeting was P. H. Lee, of Chungking, China, who has spent about six months in this country—almost all of the time in Milwaukee—to learn our methods of making good steel castings. Since arriving here, Mr. Lee has been studying operations at various foundries in the Milwaukee and Racine districts.—*John E. Hubel.*

Western New York

"MODERN Cleaning Room Practice," as it is applied in the steel casting industry, was the subject presented to members and guests of Western New York Chapter at their March meeting by one of its own members, Milton P. Schemel, Symington-Gould Corp., Depew, N. Y.

Mr. Schemel's talk, based upon years of practical experience in supervising steel castings cleaning room operations, covered this subject in a thorough manner. He discussed methods of removing gates, risers and flashings, sandblasting, heat treating, welding, straightening and inspection. He recommended the mixing of some sand with shot to reduce static in the sand blasting operation.

Among other suggestions offered by the speaker was the placing of responsibility on individual workers for efficiency and safety. Chippers, for instance, should sharpen their own chisels to suit the particular operation and the chipper. Grinders should go to the store-room for new wheels and be responsible for changing them. A careful record should be kept of the life of each wheel to determine grinding costs.

Routing castings through the cleaning room in a straight line, the speaker pointed out, was important in reducing handling costs. Some castings of each type from the previous day's heat should be cleaned as soon as possible to discover and correct promptly any defects which may be the result of foundry trouble.

Preceding Mr. Schemel's talk, an interesting motion picture on cleaning room operations was shown through the courtesy of the Pangborn Corp.

As an added attraction, a film was shown of some of the professional bowlers in action so the foundrymen present, when not cleaning castings, might get some pointers on how to clean up the alleys with strikes and spares.—*Leo A. Merryman, secretary.*

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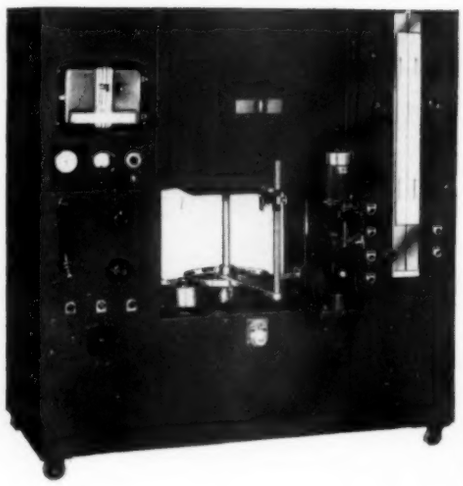

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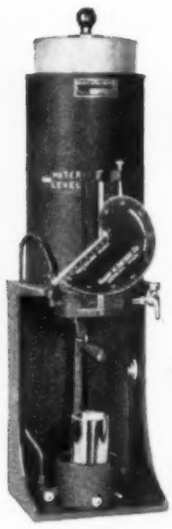

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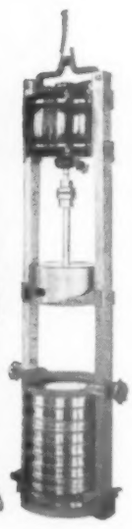

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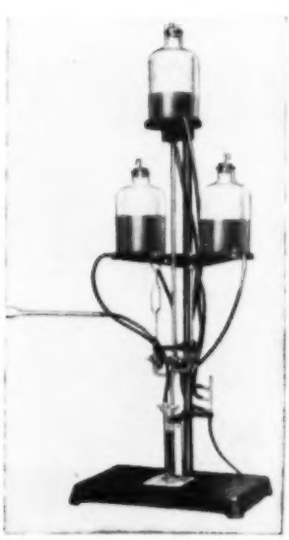

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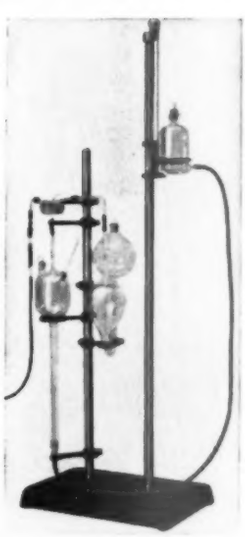

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ASTM COMMITTEES STUDY

Many Specifications

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

VARIOUS subcommittees of the American Society for Testing Materials held numerous meetings and discussions during the annual Spring Meeting and Committee Week held by the organization at Hotel William Penn, Pittsburgh, on Feb. 25 to March 1. Feature of the meeting was a discussion on "Statistical Quality Control in Its Application to Specification Requirements," with H. F. Dodge, Bell Telephone Laboratories Inc., as chairman. Speakers were Col. L. E. Simon, U. S. Army Ordnance, whose paper was entitled "Dollars for Your Thoughts," and Dr. Casper Goffman and Joseph Manuele, Westinghouse Electric Corp., whose paper related to "Use of Statistics in Writing Specifications."

Discuss Atmospheric Corrosion

On Wednesday, Feb. 27, afternoon and evening sessions were held which comprised a Symposium on Atmospheric Exposure Tests on Nonferous Metals.

Six papers were presented, three at the afternoon session and three at the evening session. Papers presented in the afternoon included "Corrosion of Rolled Zinc in the Outdoor Atmosphere," by E. A. Anderson, New Jersey Zinc Co.; "Behavior of Nickel and Monel in Outdoor Atmospheres," by W. A. Wesley, International Nickel Co. Inc., and "Resistance of Copper Alloys to Atmospheric Corrosion," by A. W. Tracy, American Brass Co. Evening session papers included "Use of lead and Tin Outdoors," by G. O. Hiers, National Lead Co.; "Resistance of Aluminum-base Alloys to Atmospheric Exposure," by E. H. Dix Jr., and R. B. Mears, Aluminum Co. of America, and "Tracking Trouble in Atmospheric Corrosion Tests," by W. E. Campbell, P. S. Olmstead, and H. G. Romig, Bell Telephone Laboratories Inc. Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys under direction of Chairman Jerome Strauss, Vanadium Corp. of America, received a report from Subcommittee X on Specifications for Castings, J. J. Kanter, Crane Co., chairman, in which it proposed to abolish the old specifications for high alloy steel castings, and develop two new specifications for heat resistant and corrosion resistant castings. The new specifications probably will be presented at the annual meeting of the society in June. The specification for corrosion-resistant alloys will list 12 grades, and that for heat resistant alloys will contain 10 grades.

It also was reported at the meeting that agreement had been reached with the Alloy Castings Institute on data to be published on alloy steel castings. This will be similar in form to tables of data on corrosion steels published by ASTM in 1942. New data on castings will be circulated to the committee for final comment and it is expected the material will be published in June.

Committee A-3 on Cast Iron, under Chairman James T. MacKenzie, American Cast Iron Pipe Co., received a number of reports from various subcommittees. Subcommittee I on Pig Iron, H. W. Stuart, U. S. Pipe & Foundry Co., chairman, reported that a new tentative on foundry pig iron A43-45T was ready for publication. Subcommittee VI on General Castings, Hyman Bornstein, Deere & Co., chairman, recommended several revisions in the wording of Standard A48-41 for Gray Iron Castings. These include the deletion of paragraph 12 and substituting "Castings must conform substantially to the drawings or to the pattern if no drawings are submitted, and they shall be free from injurious defects;" deletion of paragraph 9b and substituting "If any test bar shows defective machining or lack of metal continuity it shall be discarded;" in the explanatory notes following standard A48 notes 2 and 3 are deleted and replaced by "Higher strength irons are more expensive to produce and machine." Subcommittee VI also stated that it would have a paper prepared by James T. MacKenzie on the "Correlation of Tensile Strength and Other Properties with Brinell Hardness Values" for presentation at the annual meeting in June.

No Action Required

Subcommittee VIII on Cast Iron Culvert Pipe, W. J. Schlick, Iowa State College, chairman, stated that it had reviewed standard A142-38 on Cast Iron Culvert Pipe and no action was required. Subcommittee X on Nomenclature and Definitions, A. J. Herzig, Climax Molybdenum Co. of Michigan, chairman, recommended the advancement of tentative A196-42T to standard after addition of definitions of inoculants and chilled iron, and society letter balloting procedure. It also proposed to prepare descriptive terms of the various types or manifestations of graphite in cast iron to supplement tentative A247-41T on "Evaluating the Microstructure of Graphite in Gray Iron."

Subcommittee XI on Methods of Testing, V. A. Crosby, Climax Molybdenum Co., chairman, recommended that tentative A256-42T on Compression Testing of Cast Iron be advanced to standard as well as A260-42T on Torsion Tests of Cast Iron. Subcommittee XV on Impact Testing, James T. MacKenzie, American Cast Iron Pipe Co., chairman, reported that it was preparing to conduct further work in that field by developing new machine for impact testing to incorporate several changes found desirable.

In the general meeting of Committee A-1 on Steel it was recommended by Subcommittee VIII on Steel Castings that tentative A281-45T on Mild to Medium Strength Carbon-steel Castings for General Application be redesignated A27-45T in the new ASTM *Standards Book* for 1946, and likewise A282-45T on High Steel Castings for Structural Purposes be redesignated A148-45T, and that some means of indicating that such a change would be made to be incorporated in the 1945 ASTM *Standards Supplement*. Also it was recommended in A281-45T that a footnote be appended relative to full annealing of grade 65,000 psi-35 per cent reduction of area for railroad work be by agreement between purchaser and producer; also in A282-45T that the reduction of area requirements be reduced in the 120,000 psi grade from 35 per cent to 30, and in the 150,000 psi grade be reduced from 25 per cent to 22 per cent to bring those values into conformance with those usually encoutered.

Bring Specifications Up to Date

At the meeting of Committee B-7 on Light Metals and Alloys, D. L. Colwell, U. S. Strategic Bombing Survey, chairman, it was reported that Subcommittee II on Aluminum Alloy Castings was working to bring its specifications up to date. Subcommittee VI on Anodic Oxidation of Aluminum and Aluminum Alloys reported that a new non-destructive test method for anodic coatings has been developed and plans are being made for further evaluation before drafting a proposed ASTM test. Plans were also made to co-operate with Committee B-3 on Corrosion of Nonferrous Metals and Alloys in a test program for light metals. At the suggestion of the foundry division of the Aluminum Association and the Aluminum Research Institute, a review is being made of the standard system of nomenclature for wrought and cast alloys.

Reports to Committee E-3 on Chemical Analysis of Metals, G. E. F. Lundell,

National Bureau of Standards, chairman, mentioned a number of important revisions and new methods for publication in the 1946 book of ASTM *Methods of Chemical Analysis of Metals*. These include "Recommended Practice for Photometric Methods for Chemical Analysis of Metals;" "Photometric Methods for Chemical Analysis of Magnesium-base Alloys;" Chemical Analysis of Copper and Copper-base Alloys." Standard E30 on Standard Methods of Chemical Analysis of Steel, Cast Iron, Open-hearth Iron and Wrought Iron has been revised and expanded to include a procedure for selenium; determination of sulphur by direct combustion, and of nitrogen in steel.

Methods of Chemical Analysis of Ferroalloys, E31, has been revised considerably. As a result of a study of methods of sampling methods, the section of E30 on Methods of Sampling Steel, Cast Iron, Open-hearth Iron and Wrought Iron has been removed, and will be established as a separate standard. Methods of Chemical Analysis of Special Brasses and Bronzes have been revised and augmented by addition of procedures for determination of iron, phosphorus, nickel, manganese, arsenic and antimony.

HONOR STEEL FOUNDERS

At 44th Annual Meeting

FORTY-FOURTH annual meeting of the Steel Founders' Society of America, held at the Edgewater Beach Hotel, Chicago, Feb. 13-14, included three general sessions devoted to discussion of subjects affecting the industry. A feature of the second day's luncheon was the honoring of several of the society's prominent members with the presentation of awards and citations on behalf of the board of directors.

Edgar D. Flintermann, Michigan Steel Casting Co., Detroit, and president of the society, made the awards. A. M. Andorn, executive vice president, Penn Steel Castings Co., Chester, Pa., was awarded the Lorenz Memorial Medal for 1945 in recognition of his outstanding contributions to the general welfare of the industry. John B. Caine, chief metallurgist, the Sawbrook Steel Castings Co., Cincinnati, received the society's Technical and Operating Medal for his work in advancing the technical development of the industry during 1945.

Special citations were presented John Howe Hall, consulting engineer, Swarthmore, Pa., William C. Hamilton, research consultant, American Steel Foundries, Chicago, and Frederick A. Melmoth, formerly vice president, Detroit Steel Casting Co., Detroit. These were in recognition of the many contributions by these individuals to the advancement of the industry over a long period of years.

Speaker at this luncheon session was Charles E. Moore, president, Joshua Hendy Iron Works, San Francisco, who made a plea for better co-operation between management and labor in the interest of preserving private enterprise. "The Present Status of Management-Labor Relations" was the title of a talk given at one of the general sessions by Vincent P. Ahearn, former chairman of the industry section of the one-time War Labor Board and executive secretary, National Sand & Gravel Association. This talk was part of an industrial relations symposium which also included papers by Ross L. Gilmore, president, Superior Steel & Malleable Castings Co., Benton Harbor, Mich., and Frank Rising, general manager, Automotive & Aviation Parts Manufacturers Inc., Detroit.

TECHNICAL MEDALIST: John B. Caine (left), chief metallurgist, Sawbrook Steel Castings Co., Cincinnati, receiving the Technical and Operating Medal of the Steel Founders' Society of America from Edgar D. Flintermann, society president. This award, presented at the society's recent 44th annual meeting, was one of several made in recognition of outstanding contributions to advancement of the steel casting industry

CORES FOR SALE

(*Continued from page* 87)

requirements. Standard lengths of wire, used in considerable volume, always are kept in adequate storage.

Cores are loaded into the oven from the side adjacent to the coremakers' benches. As they are made, they are transferred to storage racks to wait their turn in the oven. When baked, they are removed from the opposite side of the oven and racked for cooling. After cooling, they are moved either to the assembling and pasting department, or to the shipping department.

A separate department is maintained for the assembly and pasting of cores. The workers here devote their time exclusively to these operations, thus, like the coremakers, achieving maximum production.

For shipment, cores are laid in shallow wood shipping boxes with sawdust as the packing material. The company has 2000 of these boxes which are returnable. City deliveries are made by two 1½-ton trucks; deliveries outside Chicago and over a 200-mile radius are made in truck trailers. Although the cores are only loosely packed in the saw-

dust, experience shows that breakage is negligible.

Output of cores is holding at about the same level as during the war. Depending upon size, production frequently runs to 10,000 per day, and the range embraces everything from pin cores up to complicated ones weighing 100 lb.

Currently the plant is operating a 40-hour week of five 8-hour days. At times during the war a 58-hour week was maintained with five 10-hour days and 8 hours on Saturdays. Staggered hours are scheduled for the core oven so that cores made during the latter part of the day can be baked during the evening and thus clean up each day's run on the production benches.

Coreboxes are supplied by the customer. When core runs are large, the company sometimes is able to suggest or effect changes in boxes that will result in faster production, thereby reducing the cost of the finished cores. Upon occasion, the company may have a new corebox made on its own initiative if appreciable advantages are to be gained. An example of this is a simple pin core in which production in multiple is more practical and economical than individual production with the corebox furnished. The company also sometimes designs and supplies core dryers where these are needed and are not furnished.

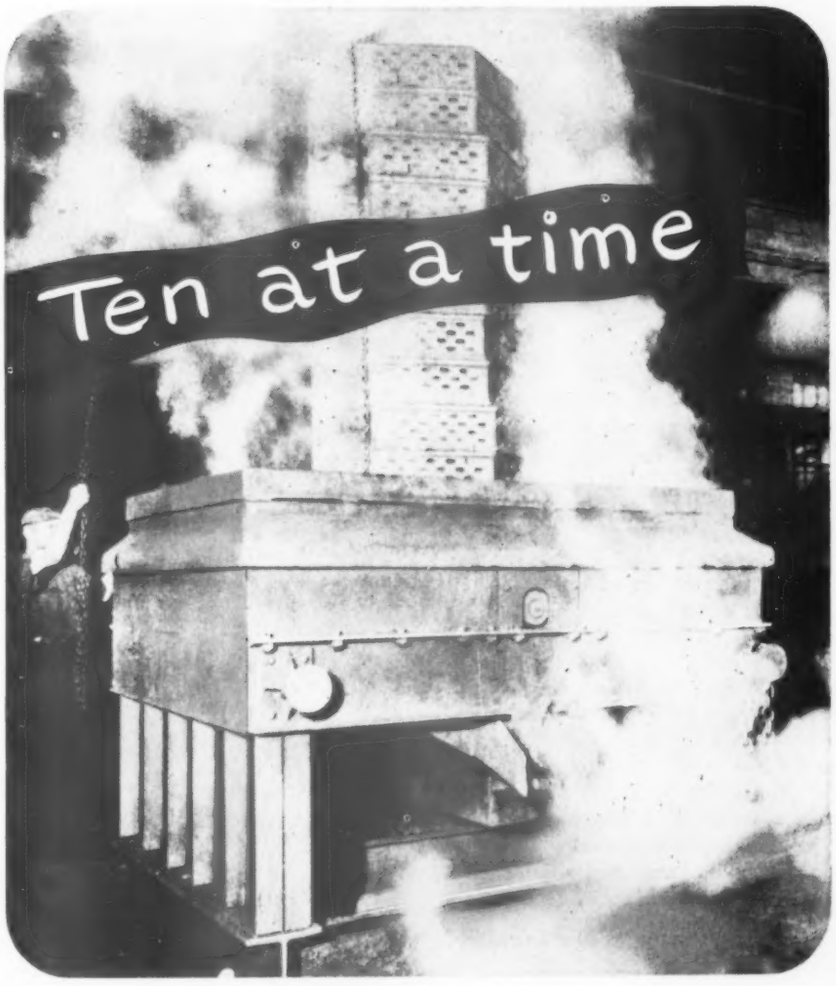
Select Suitable Sand

Customers usually specify the core sand mixtures to be used in the cores they order, and the company meets these specifications. When the mixture is not stated, the company utilizes one which in its judgment will produce the most satisfactory cores. It frequently happens, however, that the customer finds the company's mixture equally as good as his own and adopts it.

Accurate account records are kept of every coremaking job handled. Shown on the record is such vital information as part number, size of production run, time of running, whether corebox is stored or returned to customer, etc. Thus, re-orders can be scheduled and sent to the shop speedily.

A substantial portion of the Coremakers Co. business originates from foundries whose coremaking facilities are inadequate to meet castings production requirements. Some foundries, on the other hand, find it more economical to purchase cores than to make them, and a few have discontinued their own coremaking activities altogether. This trend would seem to indicate that under certain conditions, at least, cores can be made at less cost in a commercial coremaking shop employing mass production methods than in a foundry's own coreroom.

Recently a number of casting pur-



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chasers have been contracting for their own cores and having them shipped direct to the foundries making the castings. During the present period in which castings production is lagging far behind demand, the user resorts to any device that will speed the flow of deliveries. Foundries frequently have metal melting capacity to pour castings but lack coreroom capacity to maintain molding operations at the required rate.

Coremakers Co. is now consummating negotiations for purchase of a new and larger plant and expects to relocate its business within the next few months. Here, railroad siding will make carload delivery of sand possible and present the opportunity to unload and store it mechanically. In addition, numerous core-handling operations will be conveyorized. Core baking equipment contemplated will include a horizontal conveyor-type oven for the smaller cores and several truck-type ovens for the larger ones, all oil fired.

This larger plant with modern equipment will have facilities for making all sizes of cores for any type metal. Capacity-wise, sand consumption can range up to 600 tons per month, compared with the present 200 tons. Thus, the company will be in a better position to supply midwestern foundries and casting users with their core requirements.

Hastings Foundry & Machine Shop, Stratford, Ont., is erecting an 80 x 60 ft building for additional molding space in production of gray iron castings.

MATERIALS AND THE POSTWAR WORLD

(*Continued from page* 97)

and practices have been as equally important, if less spectacular, wartime developments as improvements in materials per se. In truth, many advances in quality and dependability of materials have resulted entirely from research on production methods, which permitted a superior product to be fabricated without much change in design or chemistry. Castings in general are an example of this. Very superior magnesium, aluminum, steel, and bronze castings have been made during the war as a result of careful studies of the casting process from the melting of the metal through heat treatment.

An especially interesting casting development of the war years has been that of the precision investment-casting process. The art of this method is old, but the science is very new. Benvenuto Cellini, the famous sixteenth century Italian artist in metals, used the essential features of the process in making some of the most beautiful metal art work ever produced. The method came to be known through the years as the lost-wax process, not because the knowledge of the process was lost, but because the wax pattern was destroyed in making the mold. Dentists and some manufacturing jewelers were the only people to make much use of the technique before the war. The cast-to-size gold inlay of the modern dentist is certainly a much more humane way of filling a tooth than the treatment our grandfathers were exposed to, in which the dentist beat gold foil into the cleaned cavity with a hammer and chisel.

The war brought a demand for large-scale production of complicated parts of wear and heat-resistant metals which are extremely difficult to machine or even grind. The lost-wax process was seized upon as being a potential method for producing these parts.

The part to be made is first cast in wax or plastic in a metal mold. The wax patterns are then trimmed and mounted in multiples around a common wax sprue and runners and risers in wax attached. The unit is dipped in a slurry of fine refractory material so as to have a fine surface next to the metal which is eventually poured into the completed mold. After slow drying, the dipped wax assembly is invested with a fluid refractory mix containing special binders. When the refractory mold has set, it is slowly heated to about 1800 F, during which time the wax or plastic pattern melts and burns out of the mold, leaving a cavity the shape of the desired casting. The molten metal is then forced into the hot mold, either by centrifuging or by gas pressure over metal in the furnace.

The process sounds simple and straightforward, but a great amount of research has been devoted to the devel-

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Foundry Statistics

(Reported by Bureau of the Census)

Gray Iron Castings

	Shipments—Total	Shipments—For Sale	Unfilled Orders
1944 (total)	9,165,726	.....	.....
1945 (total)	8,753,392	5,344,750	.....
Jan.	791,395	485,027	2,496,928
Feb.	752,266	464,858	2,562,076
Mar.	857,616	537,305	2,713,656
Apr.	773,988	481,237	2,640,642
May	798,055	493,698	2,602,986
June	781,935	496,662	2,596,012
July	689,711	429,100	2,564,973
Aug.	682,826	416,947	2,374,578
Sept.	661,738	392,742	2,324,620
Oct.	684,484	413,591	2,402,517
Nov.	667,506	400,919	2,453,971
Dec.	611,872	352,664	2,526,665

Aluminum Casting Shipments

(In net tons)

	Total	Sand	Perm. Mold	Die
1944	257,200	160,600	53,100	42,100
1945	186,971	98,615	53,165	34,296
Jan.	21,700	12,650	5,300	3,650
Feb.	21,000	12,450	4,850	3,600
Mar.	24,100	13,850	6,100	4,050
Apr.	21,900	12,400	5,550	3,850
May	20,700	11,350	5,450	3,800
June	18,600	9,750	5,050	3,700
July	14,550	7,000	4,350	3,150
Aug.	10,450	5,000	3,100	2,250
Sept.	7,250	3,450	2,450	1,300
Oct.	9,397	3,819	3,764	1,783
Nov.	8,741	3,479	3,609	1,622
Dec.	8,583	3,417	3,592	1,541

Steel Castings

	Shipments—Total	Shipments—For Sale	Unfilled Orders
1944 (total)	2,435,421	1,843,386	.....
1945 (total)	1,850,830	1,438,939	.....
Jan.	201,162	157,176	953,179
Feb.	186,364	146,165	1,035,848
Mar.	211,890	166,896	1,020,093
Apr.	190,166	150,281	1,001,883
May	186,376	145,092	834,428
June	167,140	125,126	765,862
July	133,601	99,606	710,783
Aug.	123,835	96,151	545,165
Sept.	110,631	82,444	503,745
Oct.	119,857	96,868	429,698
Nov.	113,694	89,088	426,766
Dec.	106,114	84,046	413,853

Magnesium Casting Shipments

(In thousands of pounds)

	Total	Sand	*Perm. Mold	Die
1944	201,487	75,221	123,904	2,362
1945	83,752	42,471	39,592	1,689
Jan.	10,424	6,149	4,028	247
Feb.	10,366	5,832	4,317	217
Mar.	12,646	6,703	5,677	266
Apr.	11,903	6,257	5,464	182
May	12,134	6,081	5,865	188
June	10,565	4,878	5,473	214
July	9,838	3,961	5,677	200
Aug.	4,960	1,820	3,036	104
Sept.	169	137	13	19
Oct.	251	216	13	22
Nov.	235	207	15	13
Dec.	261	230	14	17

*Includes incendiary bomb castings.

Malleable Iron Castings

	Shipments (Tons)	New Orders (Net)	Unfilled Orders
1944 (total)	878,233	969,483	.....
1945 (total)	790,731	766,711	.....
Jan.	78,788	97,153	483,919
Feb.	75,220	79,913	488,612
Mar.	85,307	98,979	502,284
Apr.	76,065	78,075	504,294
May	79,565	83,421	508,150
June	71,992	35,603	471,761
July	55,813	58,589	474,537
Aug.	52,647	13,029	408,861
Sept.	46,960	30,740	392,641
Oct.	59,096	88,382	421,927
Nov.	57,315	68,489	433,461
Dec.	51,963	60,036	441,534

opment of suitable waxes, dip coats and investment materials, so that castings with fine surfaces and as-cast dimensions within plus or minus several thousandth inches can be made. At first, a few ounces was the weight limit for precision-investment castings, but as improved techniques were worked out, the weight limit was raised to several pounds. Research now in progress shows promise of permitting castings weighing over a hundred pounds to be made, in the future. Gears, turbine buckets, gun parts, dies, molds, special automobile parts, optical instrument parts, and other products which are difficult to machine will be made by this war-developed method.

For many years, piano manufacturers have been interested in the possibility of lightening pianos through the use of aluminum. One of the heavier parts of a piano is the plate upon which the strings are set. This plate had always been made of cast iron, and even in a small spinet piano, weighs around 125 lb. Attempts in the past to substitute aluminum for cast iron for this part had always resulted in failure because the aluminum plate would "creep" under the tension of the strings, causing the piano to go out of tune.

Aluminum Alloy Substituted

Using methods originated during the war for developing aluminum aircraft castings for highly stressed applications, satisfactory aluminum piano plates have been produced as permanent mold castings. These plates weigh only 45 lb and thus result in a 64 per cent saving in weight. A "creep" resistant alloy and special heat treating process used during the war enabled the metallurgist to meet the requirements for an alloy of sufficient hardness to reduce to a minimum the point of contact between the plate and the strings; an alloy in which string pegs could be mounted and bent to required shapes without deforming the holes into which they are driven; and a design which would distribute the metal so that graduations of thickness in the plate would have a direct relationship to the stress involved.

The latter problem was solved by studying the stress distribution in the plate, under tension of the strings, by using a brittle lacquer. The location and frequency of cracks in the lacquer were compared with known standards and analyzed. Strain gages with electronic indicating equipment, such as were widely used for the design of airframes, were used to complete the study. Thus, these methods, perfected during the war, by research, have permitted a widely used civilian product to be improved in a manner that was previously thought impossible.

one of these

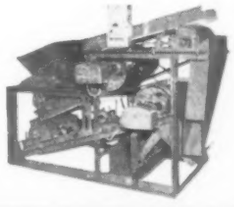
DINGS MAGNETIC SEPARATORS

Dings Magnetic Drums
Cylindrical shell revolves around stationary magnet. Separation is automatic.

...will handle your job!

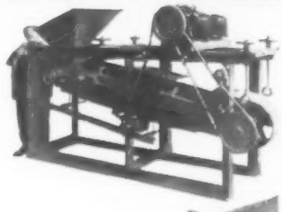
No matter how unusual or difficult a separating job you may have, there is a Dings High Intensity Separator that will handle it—with more positive results and less cost to you! This is made possible by the nearly 50 years Dings has spent developing magnetic equipment for the metal working industry. Write today for bulletins.

The Dings High Intensity Magnetic Pulley utilizes air-cooled construction and *bronze* spacer rings to provide complete, automatic separation. For use as head pulley in a belt conveyor system.

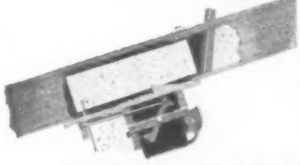


The Dings DA Magnetic Separator for separating ferrous and non-ferrous scrap. Two High Intensity Pulleys assure doubly clean separation. Feeder is reciprocating. Rubber covered idler adjusts gap between upper pulley and main conveyor belt.

Dings High Intensity Lifting Magnets feature a balance of copper wire and steel which is correctly proportioned to assure maximum lifting capacity with a minimum of weight and current input.



Dings High Intensity Type BN Separator. For separating mechanically entangled scrap. Combines magnets of alternate polarity with mechanical agitation to accomplish amazing results.



Dings High Intensity Type L Spout Magnets are designed for installation in chutes. Automatic gate discharges accumulated iron when current is interrupted.

DINGS MAGNETIC SEPARATOR COMPANY

512 E. Smith St.,
Milwaukee 7, Wisconsin

"Separator Headquarters"
Since 1899

Dings MAGNETIC SEPARATION HIGH INTENSITY

The adventures of BILL

BY PAT DWYER
Drawings By RICHEY

IF YOU think you can stick to the text," I said to Bill the other night, "I am kind of curious to know what happened to that gang of broadaxe men, fiddlers, hoi-poloi from here and there, birds, beasts and fishes, women, children and gandy dancers who maintained a picket line while Noah was building the ark. How did they arrange priorities and decide who was to have the privilege of taking a dog?" (THE FOUNDRY for March —Ed)

"Seems to me," Bill admitted handsomely, "you did say something that kind of threw me off the beam. We'll have none of that stuff tonight, my lad. As you were! At ease! Trap shut, long pointed ears open and no unseemly noises, grunts, squeals, sneezes, belches nor burps. Sniffs, snorts or loud blasts on the beak or bugle will not be tolerated. Le's see, I left off where Bill Bailey was hopping around the highlands chasing the deer. What's that? Certainly not. The word is spelled with two ees. Aa-a-hem! Le's go:"

When everything was ready for the great sailing day and the rain was scheduled to start on the following morning, Noah put on a special uniform cap and walked up and down shouting 'All Ab-o-a-r-d for Mt. Ararat and way points. Have your tickets ready.' The clansmen began to clamber up the gangplank with their wives and children to the heartbreaking strains of "Lochaber No More," a special arrangement on the pipes, with trills, runs, and grace notes by Walter Beaton.

Big Alex McDonald, with Betsy and the children, crossed the deck to his rightful place on the starboard side. He was properly amazed and indignant to find the place occupied by Black Jim Fraser and Lauchie Cameron with their families. Alex jumped 3 vertical feet in the air, cracked his heels together and roared at Noah 'What kind of shenanigans do you call this? My place smelling like a goat's nest and jammed full of Frasers and Camerons. Boot 'em off! Boot 'em off before I lose my temper.'

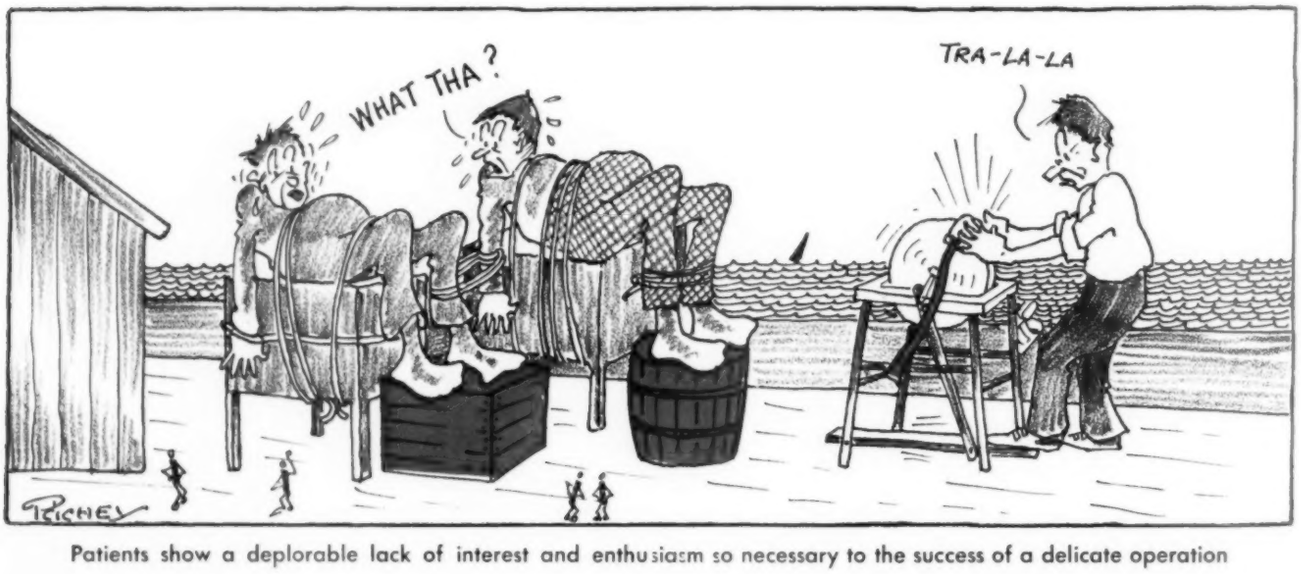
Noah did not want to make trouble with the Frasers, because his wife Christy was a sister to Black Jim. She had put the official wifely bite on him and forced him to take not only a pair of black Frasers, but about two dozen of their relatives. That is why there are so many Frasers in the world today. They got away to a head start.

Noah tried to persuade Alex to move over to the port side. Alex told him politely in gaelic to stow that kind of gab and wound up by declaring that if he could not have his own place on the starboard, or right hand side, he would walk off the job and go in his own old schooner. Noah was stymied. The Frasers hunkered down in their corner, where the younger members made derisive noises and the older and more sedate members solemnly raised the right hand in a gesture of farewell skilfully achieved by touching the thumb to the tip of the nose and wiggling the extended fingers. With characteristic Scottish generosity this spontaneous and open-hand gesture never was patented or copyrighted. It was adopted quickly by all civilized nations and has continued in use down to the present day.

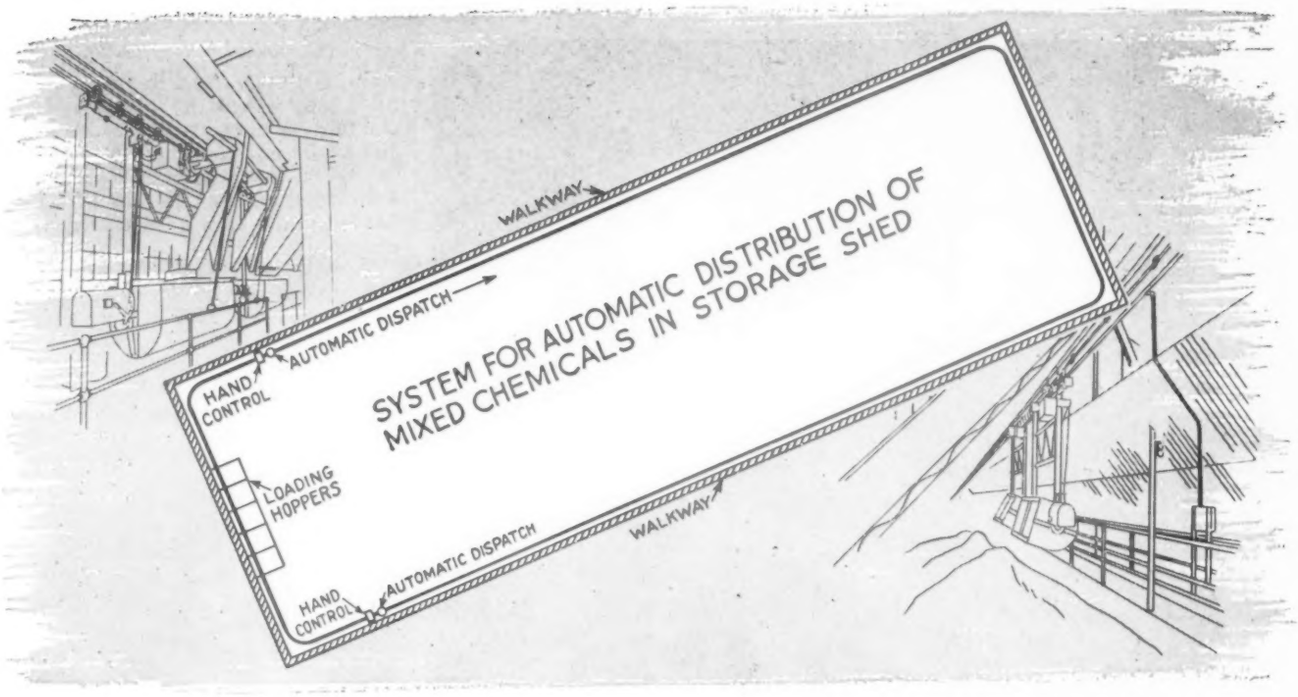
As a matter of historical lore it is interesting to note that when the clans went out to support the cause of Bonny Prince Charlie, the battle of Culloden was lost because the McDonalds refused to fight when they were given position at the left of the Frasers and the Camerons. If the McDonalds had not staged this sit-down strike, if they had swept down in a wild highland charge with the pipes shrilly screaming and the long claymore swinging in glittering and murderous arcs, Charlie would have had a comfortable and well-paid job for the remainder of his life, and the McDonalds could have taken over all the civil service positions. Well, Chas was pushed out of the picture and that's that. Ramsey and a few of the boys made the high seats in the early part of the present century, but that is another story.

For a long time Big Mary McCuish and Jessie McGregor had their eyes on young Colin McDonald and his cousin Angus. Before Big Alex and his schooner pulled away the ladies began to cry. They begged the boys to come aboard and kiss them goodbye. The boys gallantly climbed on board to confer this small favor. While they were at it Jessie bribed her young brother with a thrippeny bit—an heirloom in the family—to cut the gangplank adrift and let the ark go floating away with the tide. When

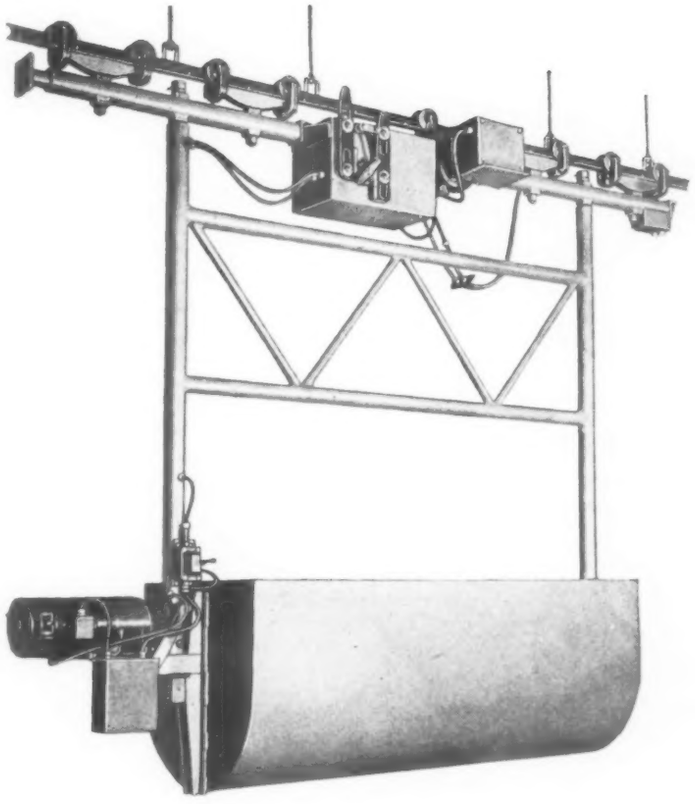
(*Continued on page* 204)



Patients show a deplorable lack of interest and enthusiasm so necessary to the success of a delicate operation



10 Years of Automatic Operation



AUTOMATIC handling is not new with American MonoRail. This system has been in operation over 10 years. Since the original system was installed, two additional automatic carriers have been added. It has been continuously operated day-in and day-out with remarkably few replacement parts.

The automatic dumping bucket carries a cubic yard — travels to movable stop at 150 f.p.m. — dumps automatically — returns to loading station at 400 f.p.m. Movable stops are set to where material should be dumped. The carrier does all the dumping after being loaded and dispatched from the loading station.

Whatever your handling problem may be, there's an American MonoRail System best suited to your individual needs. Consultation in connection with any handling problem is available without obligation.

THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE CLEVELAND 7, OHIO

CRYSTAL SILICA
99 89/100% PURE
Tailored to Your Requirements!
FLINT
MOLDING AND CORE SAND
SILICA

OTTAWA SILICA CO. offers . . .
WASHED
DRIED
SCREENED
GRADED
WHITE SANDS

Our specially prepared SILICA SANDS are available in various sizes. We have the particular grade best suited for your requirements. ¶ You will find our SANDS most suitable for cores—they save oil—they are clean, uniform and constant in quality. ¶ SILICA FLOUR, at its best, for foundry uses.

OTTAWA SILICA COMPANY
Ottawa, Illinois

(*Continued from page* 202)

Angus and Colin found they were shanghaied they were fit to be tied, so Noah tied them by marrying them to Mary and Jessie. He had no choice in the matter. Whenever a McCuish or a McGregor woman gets her eye on a man that strikes her fancy, the jig is up and there is no escape.

Big Alex took a whole boat load of McDonalds on his schooner and prepared to follow the ark. He had no chart or no compass, but as he pointed out very logically 'We don't need 'em. We ain't goin' no place in particular.' The mob he had on board accounts for the fact that today there are about as many McDonalds as Frasers. Alex ran in a kind of a joker on that deal.

On the fifteenth day out, Bill Bailey down in the hold feeding the animals came running up to tell Noah that the ark had sprung a leak. A dog chasing a rat had scratched a hole right through a plank. Noah ran down the ladder and hit the dog a kick with his hobnail shoes

Noah sets up air mail service

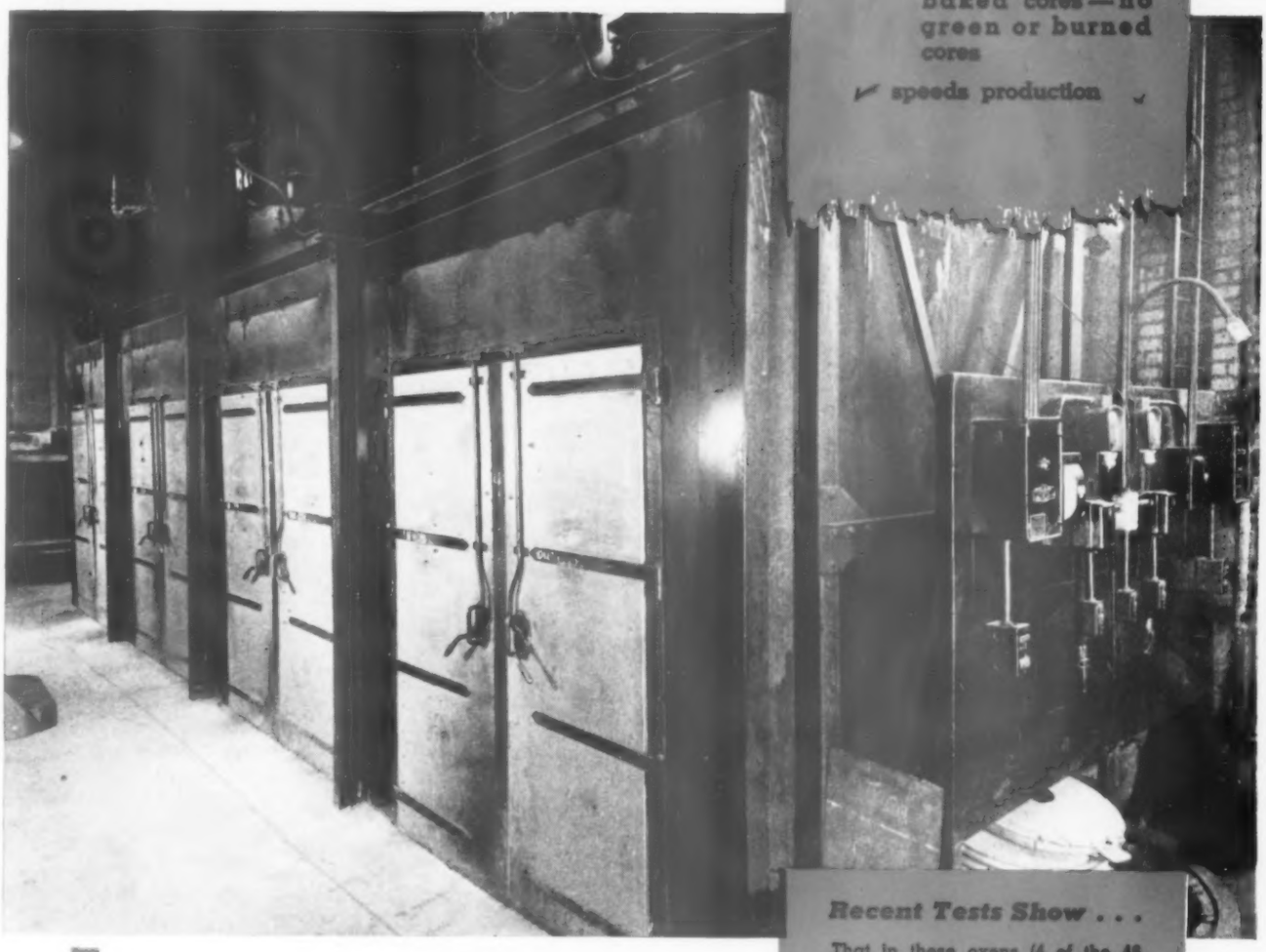
that landed the animal in the lee scuppers. The shoes were in great shape, newly half soled and heeled by Angus McKay. The McKays have been shoemakers and cobblers ever since. Noah tried everything he could think of to stop the water, but without success. At last he just squatted on the hole and hollered to Angus McCuish and Johnny Morrison to get buckets and bail the water. For 25 days and 25 nights the dog had to stay out on the cold deck, while Noah sat on the hole and Angus and Johnny bailed enough water to fill the Caledonia Canal.

When they finally reached dry land McCuish's and Morrison's toes had grown together. They had web feet from being so long in the water. Noah instructed Johnny Marshall to take his broadaxe and cut the toes apart. Johnny put the feet up on the chopping block where he fastened them steady in place with timber dogs. Then he touched up the edge of the axe on a pet oilstone and nicked

(*Continued on page* 206)

BATTERY OF 4 MAEHLER CORE OVENS

- reduces baking time
- produces more evenly baked cores—no green or burned cores
- speeds production



Recent Tests Show . . .

That in these ovens (4 of the 48 Maehler units at the Howard Foundries in Chicago) cores for aluminum castings are baked with a maximum degree of uniformity. One of the ovens accommodating 8 large cores (31 inches square) on 2 large racks requires one hour and five minutes to reach a temperature of 450° F. It requires only three hours of baking time at this temperature. Reports show that temperature uniformity is virtually perfect.

INEFFICIENT core ovens can play havoc with your production schedules as well as your operating costs. Maehler re-circulating air heat ovens can help you keep these important factors in line. The re-circulating air heat principle, originated by Maehler, assures you of *perfect* heat uniformity resulting in more uniformly baked cores, elimination of core loss and shorter baking time.

The installation shown above at the Howard Aluminum Foundries, is an example of how today's top-flight foundries are using Maehler ovens for faster core baking. These Maehler gas-fired units handle the baking of the largest cores in three hours at 450° F. (These cores measure about 31 inches square, 10 inches deep through center and 4½ inches deep around edges.)

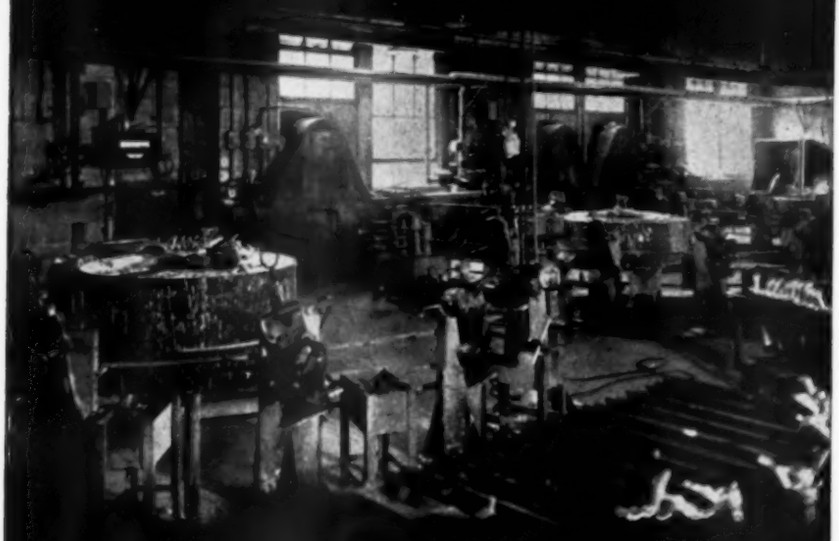
Maehler core and mold ovens are available in a complete range of gas fired, oil fired and electrically heated units for producing better, more evenly baked cores—faster at less cost. Call a Maehler engineer today or write for latest bulletins.

THE PAUL MAEHLER COMPANY
2200 W. Lake Street, Chicago 22, Illinois

MAEHLER

Industrial Ovens and Furnaces for Core Baking, Mold Drying, Heat Treating, Enameling etc.

HAUSFELD FURNACES



MAGNESIUM DIE-CASTING

Battery of HAUSFELD 600 lb. Magnesium Furnaces in Die Casting Plant

Photos courtesy of ARMSTRONG CORK CO. Lancaster, Pa.

The Campbell-Hausfeld Co.

300-320 MOORE ST. HARRISON, OHIO

(*Continued from page* 204)

the ends of the feet to form toes. A very neat job indeed except for a slight technical error. Johnny figured that five toes meant five nips with the axe. He cut five gashes in each foot and then for the first time noticed that each foot was adorned with six toes instead of five. And that is where the six-toe McCuishes and Morrisons came from. Dog's noses always are cold since Noah's dog had to lie out in the rain for so many days and nights. Because Noah had to sit so long on the hole to keep the water out, men down to this day stand with their backs to a fire and hold their coat tails up with one or both hands.

After the rain stopped and the freshet ran out a bit Noah came up out of the hold. He gazed all around but could not see any land. He did not want to make a mistake and land in Ireland where the inhabitants met invaders with showers of cobblestones, or in England where the natives would not speak to them unless they were introduced properly by a recognized and reliable third party. His letters of introduction were all wet and he did not have an old school tie.

Figuring that one of his pet pigeons was growing a bit too fat and saucy for lack of exercise, he whirled him around his head three times and then let him go with strict admonition to take a gander around here and there and see what he could see. 'Come back as soon as you can,' he said, 'and don't try to run in any rannygazoo stuff on your expense account.' The pigeon came back and brought back exactly what a great many people traveling on expense accounts bring back, and that is precisely nothing.

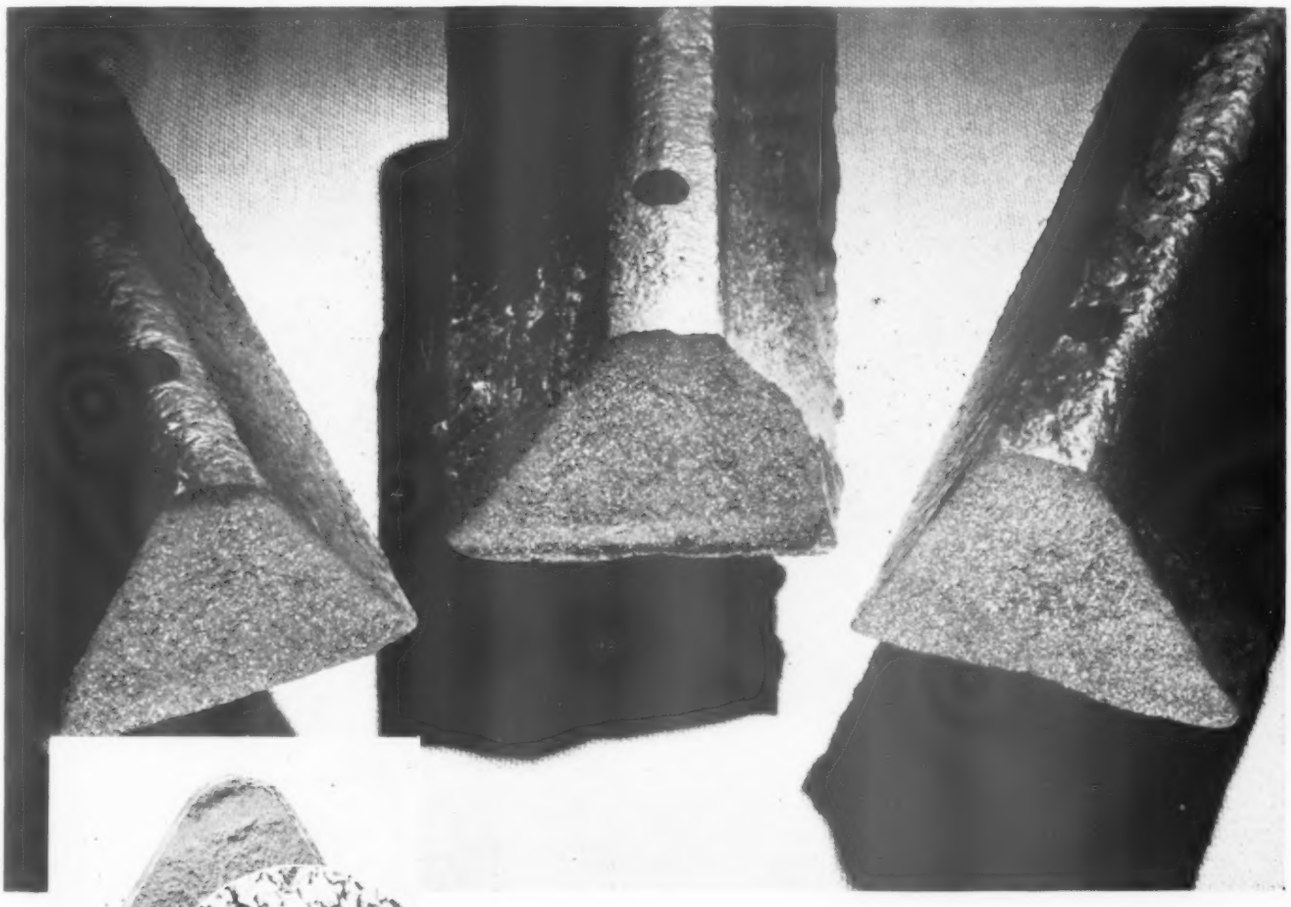
Near the end o' the week Noah sent the pigeon out again and this time the bird brought back a small olive branch. Here is where we split away from recorded history. There are not now and never were any olive trees in Scotland. Taking into account prevailing conditions at the period it is only reasonable to assume that Noah, filled to the gunnels with a tankard of usquebaugh from a still contrived by the boys in a quiet corner, could not say 'Ha. Spr-r-rig o' heather-r-r-r fr-r-ae Tober-r-mor-r-r-ie!' A possibility exists that Noah made the grade, but his secretary belonged to the school which afterward contributed Joke No. 3 to Joe Miller's famous collection. The one about the cop who dragged the body of a horse six blocks from Mrnbskzkoski to Grant Street, because he could not spell Mrnb and so forth on his report. Anyway, the word went down as olive, and it is too late now to do anything about it.

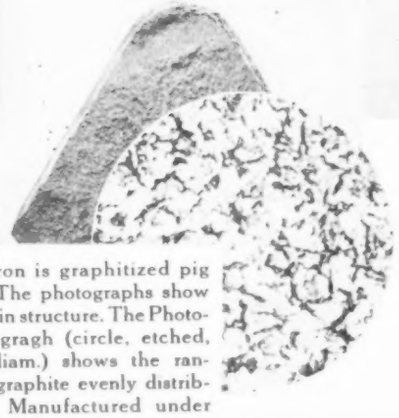
With the water going down fast, Noah in the ark and McDonald in the schooner ducked and jouked among the islands until they came to Greenock and Gourock and then up the Clyde to Glesga. By the time they cleaned the ship and sluiced her down and shoveled all the mud and stuff out of the houses and barns, the river looked like the delta of

(*Concluded on page* 208)

These "3 LITTLE PIGS" tell the story of G-IRON*

Each a different silicon content... yet all the same uniform grain structure





*G-Iron is graphitized pig iron. The photographs show its grain structure. The Photomicrogragh (circle, etched, 500 diam.) shows the random graphite evenly distributed. Manufactured under U. S. and Canadian patents.

	LEFT	CENTER	RIGHT
Silicon	2.12	2.71	3.35
Total Carbon	4.18	4.01	3.79

Note refined, uniform grain structure of these G-Iron pigs with varying silicon content. This same uniformity follows through into the casting, making possible the production of thin and thick sections, without internal shrinkage and porosity, and improved machineability.

TONAWANDA for sound castings

TONAWANDA IRON CORPORATION

NORTH TONAWANDA, N. Y.

Division of American Radiator & Standard Sanitary corporation

NEW and UNIQUE! » THE CARTRIDGE BENCH CORE BLOWER

*Users report remarkable increases in quality and quantity of production

Produces variety of intricate cores with unusual speed and simplicity.

Comes ready to use—virtually no installation cost.

Can be operated with unskilled labor — extremely easy to use.

If you make cores 2 lbs. or under—this unit ideally suited to your use.

Designed by two practical foundrymen.

WRITE for complete details and new booklet.

Core boxes can be made very light, in most instances bench equipment now used can be converted for blowing. Almost any sand now commonly used on the core bench may be used for blowing cores. Adjustment for boxes of different height, size and shape made instantly.

To operate, core box and cartridge are held down by pressure handle while left hand operates blow valve. After core has been blown, the box is pulled forward and cartridge is lifted off and the work of drawing core is completed on base of machine.

FILLS NEED FOR SIMPLE, FLEXIBLE CORE BLOWER

The New *Redford Cartridge Bench Core Blower* has met with enthusiastic acceptance by foundrymen because it supplies an important need in the foundry for an efficient, low-cost method of blowing small, intricate cores. It requires no large volume of air and readily lends itself to handling a variety of core boxes. In fact, they tell us that it is the ideal method of making cores in single or gang boxes requiring a maximum of 2 lbs. of sand.

SAND CARTRIDGES AVAILABLE IN 8 STANDARD SIZES

Blower comes complete, ready to use. Each blower provided with one Size "C" sand cartridge which is adaptable to a large range of core boxes. Cartridges are available in seven additional standard sizes and special sizes furnished where needed.

★ Cartridge Bench Core Blowers

Redford IRON & EQUIPMENT CO.

Phone: REdford 8610

21315 West McNicholls Rd. Detroit 19, Michigan

(*Concluded from page* 206)

the Mississippi. Later generations had to dredge a channel through it in which to launch the wood and later the great steel ships. Noah the organizer soon had everything running in perfect order with a still in every house making whiskey for shipment to the United States.

"'Tis a fine piece of work," I admitted; "I wonder if any person ever came to bat in a similar manner for the Owld Sod."

"You wonder!" Bill exclaimed in surprise. He lifted his voice in song: "Sure a little bit of heaven fell from out the sky one day, and it nestled on the ocean in a spot so far away. And when the angels found it, sure it looked so sweet and fair, they said 'Suppose we leave it for it looks so peaceful there.' So they sprinkled it with star dust to make the shamrocks grow. 'Tis the only place you'll find them no matter where you go. Then they dotted it with silver to make its lakes so grand, and when they had it finished, sure they called it I-i-i-er-land!"

To Hold Lighting Exposition

An international lighting exposition, sponsored by the industrial and commercial lighting equipment section of National Electrical Manufacturers Association, will be held April 26 to 30 in the exhibition hall of the Stevens Hotel, Chicago. Practical applications of the newest developments in illumination will be shown, many of them for the first time.

Four morning conferences, to be held in conjunction with the exposition, will afford opportunity for round-table discussions and forums on practically all subjects related to the application, utilization and sale of lighting equipment.

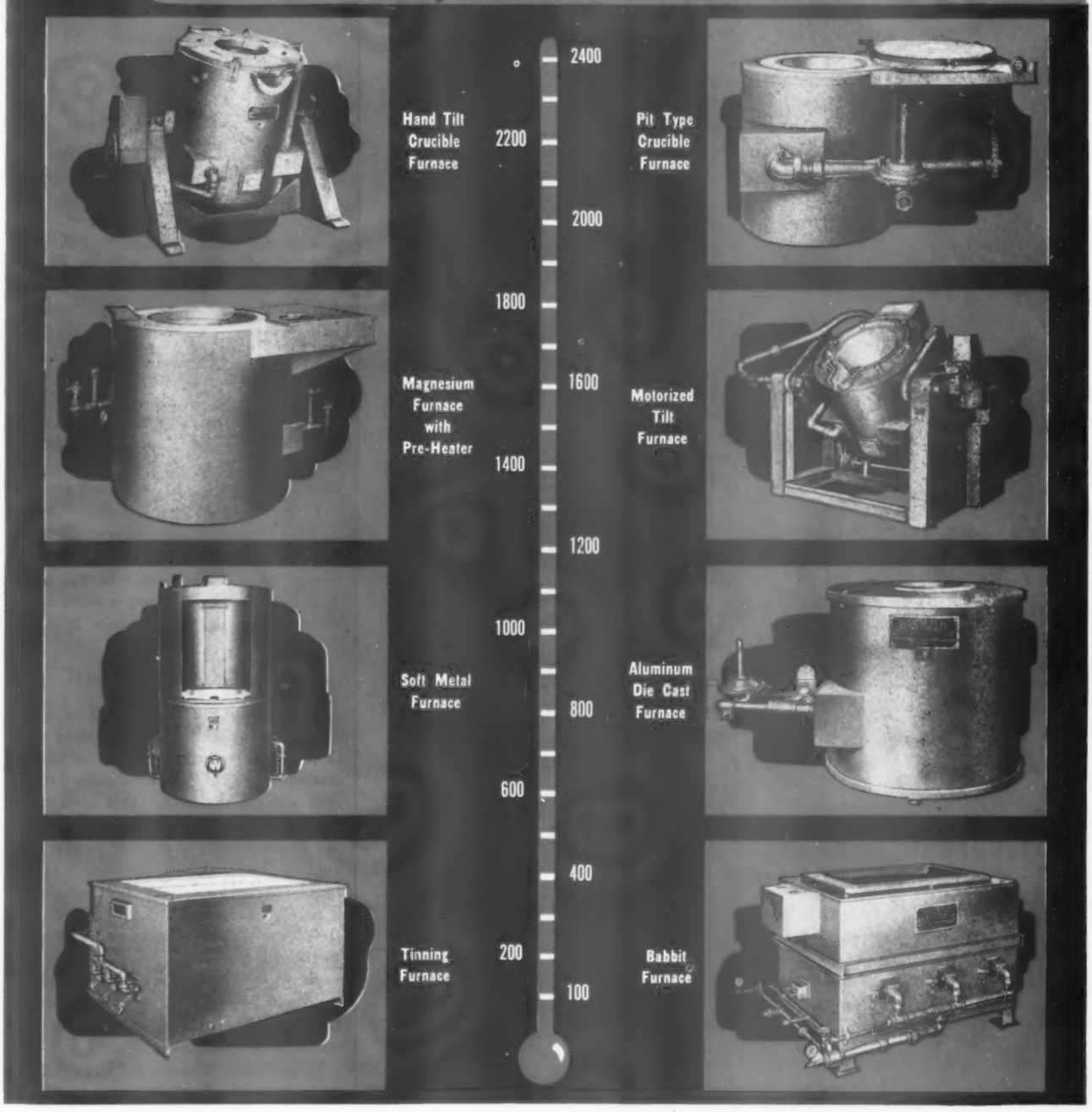
Adds Industrial Gas Heating Division

Bryant Heater Co., Cleveland, has established an industrial division to handle the development and distribution of an improved line of mixers, injectors, burners and specialized items of gas combustion equipment for industrial and process equipment. Donald A. Campbell, specialist in gas and combustion engineering, heads the new division.

Changes Name of New York Office

New York City district office of the Kuhlman Electric Co., has been changed to J. E. Bevan Co. Inc. Location of the office in the Graybar building, 420 Lexington Ave., remains unchanged.

What Degree "FURNACE HEIT"?



Whether it's brass, bronze, magnesium, aluminum, tin, lead or a soft metal, a suitable Eclipse Melter can be selected for your requirements.

Backed by over a quarter of a century of experience and development, you are assured of a unit constructed to give the minimum of maintenance at an economical operating cost.

Consult our representative in your locality regarding your requirements.

Eclipse Fuel Engineering Company
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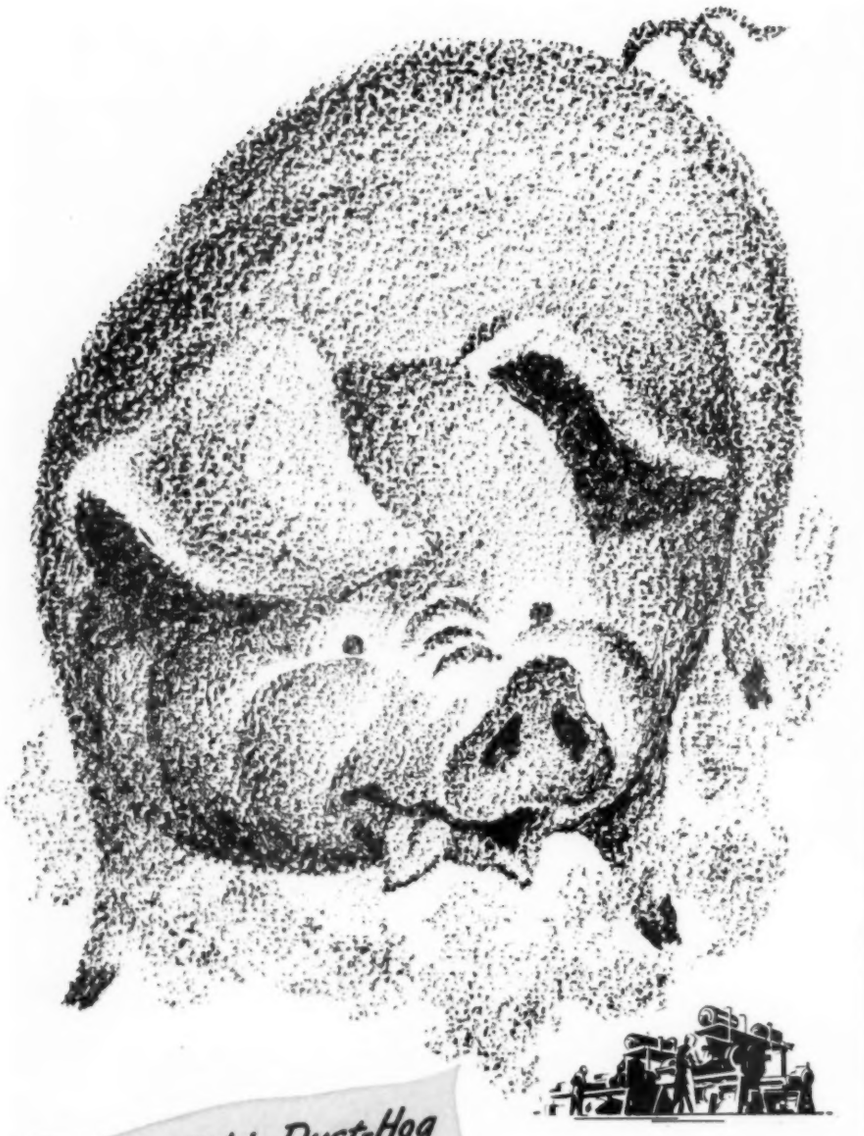
McKee Eclipse



Like bad air, poor light and obsolete tools . . . Dust-Hog keeps a man from doing all he might. Dust . . . in his eyes . . . dimming his light . . . begriming his work . . . slows him down, invites mistakes, spoils morale.

Consider the money dust control saves — improving efficiency, reducing maintenance, reclaiming dust by-products. Pangborn's free booklet, "Control of Industrial Dust", brings you up to date on how to clear out costly "dust pockets".

Write Pangborn — *world's largest manufacturer of dust control and blast cleaning equipment.*

Pangborn

PANGBORN CORPORATION, HAGERSTOWN, MARYLAND

VENTILATING THE MOLD SHAKEOUT

(*Continued from page* 105)

conveyor which operates on a track. The conveyor is continuous. with a loop at each end, and in the course of its travel passes the molding positions. The drag part of the mold is handled to the conveyor by a suitable crane. Cores, if any, are set, sometimes as the mold progresses to the point where the cope part of the mold is made, and then the mold is closed. The mold then progresses to the pouring position, where the metal is poured while the mold is moved along. The poured mold passes through a cooling and smoke hood in various lengths, up to 80 ft. The subsequent operation is to remove the pouring sprue and risers and open the mold, the latter being done while the mold is in movement. This facilitates more rapid cooling just before the shakeout position.

The cope is shaken out first. As the mold approaches the shakeout the cope is lifted off by hand or by a crane and placed on the shakeout. In the meantime, the drag progresses onward to the drag shakeout position, where it is handled likewise.

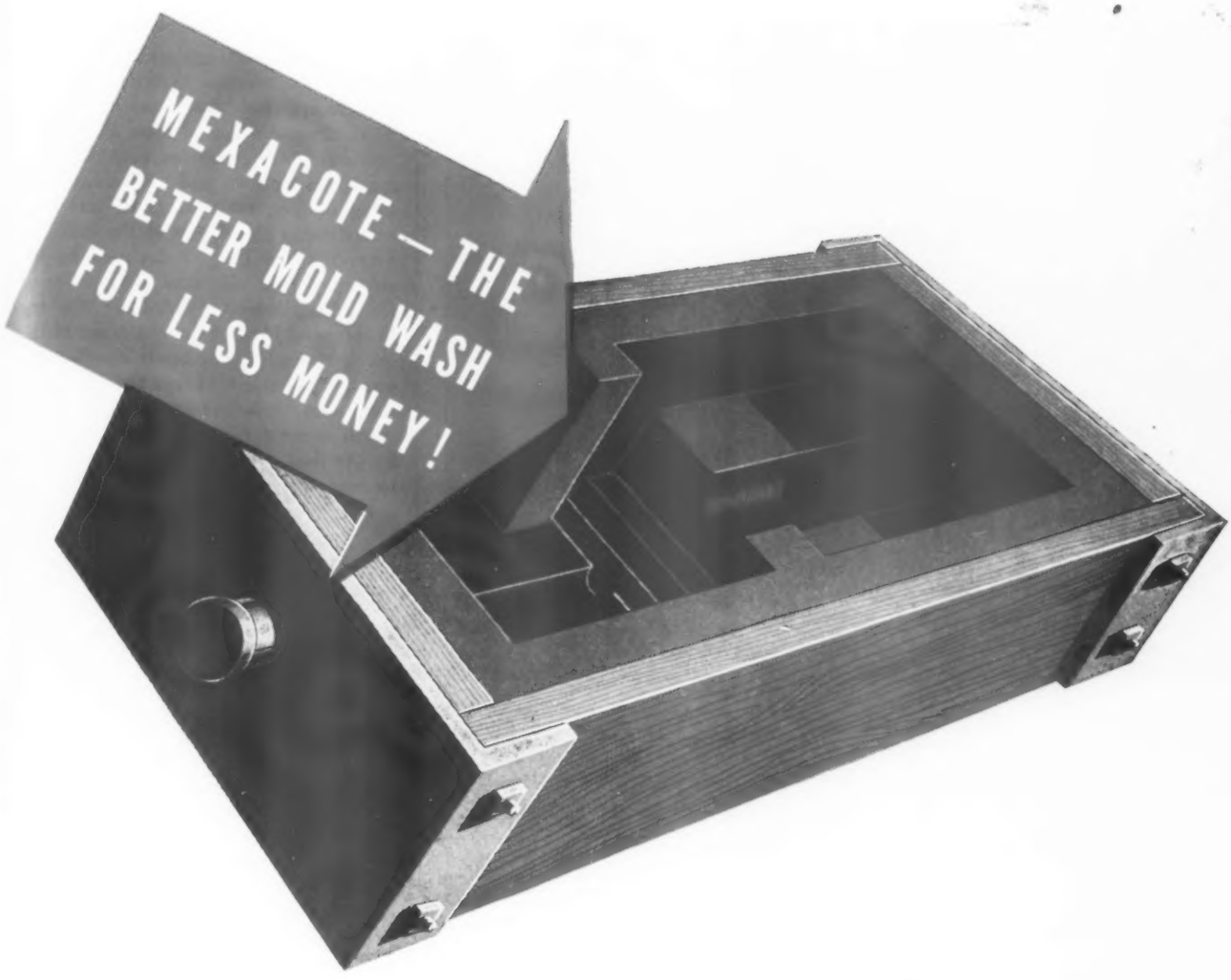
Dump the Entire Mold

In some installations, instead of manually handling the cope and drag parts of the mold separately, the entire mass of castings and sand is automatically dumped onto a single shakeout. This latter method is used for small molds made in stripper or snap flasks so that no flask is present at the shakeout position. In the former method the flask parts usually are a part of the job until shaken out. The flasks are then retrieved and returned to the molding position by a return conveyor. The castings either are handled by a castings conveyor or placed in containers or on trucks for conveyance to subsequent operations.

In foundries where very large castings are produced, the molds are carried direct from the molding position to the shakeout by overhead cranes. A typical installation is shown in Fig. 3, where the mold is approximately 16 ft long. Here, drag cope and bottom plate are handled by the crane and turned over on the shakeout.

Design of the dust removal hood, air volume used and shielding from cross drafts is of utmost importance in these jobs. A very large volume of dust is produced by the operation, and since the sand is at high temperature convection currents tend to carry the dust upward at high velocity. Unless the hood is properly designed and the air velocity

(*Continued on page* 212)



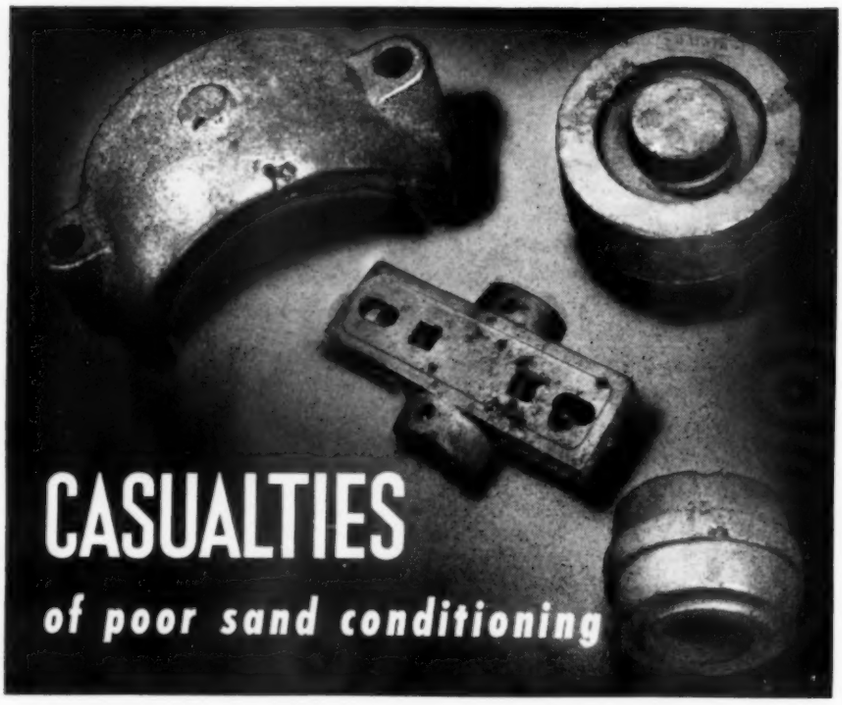
NO CRACKS, NO BLISTERS, NO PEELING ON MOLDS SPRAYED WITH MEXACOTE

Mixed into a paste, then thinned with water to 40°-60° Baume, Mexacote sprayed on molds hits a new high in mold wash efficiency. The surface may be quickly dried, immediately after application, with a blow torch and no matter how severe the torching, it will not crack, shrink, scab, peel, or buckle. Mexacote is versatile—may be used on all kinds of green or dry sand or loam molds. Mexacote is fire proof—it contains no hazardous volatile matter. Mexacote saves time—it helps insure smooth, clean, castings and thus eliminates much of the usual cleaning. Mexacote is the all purpose blacking—equally effective on either molds or cores. When dipping cores apply at 35° Baume; when spraying, apply at 25° Baume. .

In spite of its effectiveness, speed of application and improvement of casting quality, Mexacote costs less than other mold or core washes. If you are interested in improving your casting surfaces, saving time and cutting your foundry costs write us today for complete facts.

Mexacote

THE UNITED STATES GRAPHITE COMPANY • SAGINAW, MICHIGAN



Thousands upon thousands of castings are ruined every day in foundries throughout America because of poor sand conditioning methods. If your foundry is losing castings this way, put an American Sandcutter on the job.

There's no equaling the condition of sand cut with a Sandcutter. It can be prepared in accordance with individual requirements for moisture, bond, and permeability. It riddles fast, rams easily, and vents perfectly.

The Sandcutter's action is very thorough, not a particle of sand escapes the whirling blades as they cut through the heap again and again. A man with a shovel usually cuts through each foot of sand only six times at best. A sandcutter cuts every foot at least 100 times!

Dry spots, wet spots, lumps, and pockets of new sand cannot escape the churning, blending action of the cutting cylinder. The sand is thoroughly mixed, aerated and cooled as it is thrown into the air and tossed from side to side.

Watch your casting "casualty list" shrink as the Sandcutter supplies your foundry with sand that is cut "right". See your whole production effort increase in efficiency as your costs in time, labor and rejects decrease.

Send for additional data on a Sandcutter today!

American Sandcutter
FOUNDRY EQUIPMENT CO.
505 S. BYRKIT STREET, MISHAWAKA, INDIANA

(*Continued from page* 210)

into the hood is high enough to overcome the convection currents, the dust will escape into the room above the hood. Contamination of room atmosphere will result. Other factors, such as working space for men and mechanical handling devices, must be taken into consideration in the design of the hood. In Figs. 1 and 3 (Fig. 1 designed by the writer) ample clearance for the crane slings is provided by holding the top of the hood back of the centerline of the shakeout. Ends of the hoods are closed as much as possible to reduce the open area, sometimes called face area, through which counter currents must be set up by the dust collector and/or exhaust fan to successfully capture the dust.

Hoods must be made exceptionally heavy to stand the abuse afforded by the crane movement of very heavy molds. Even though made of exceptionally heavy steel members damage eventually results, therefore it is advisable to construct the hood so that parts subject to damage may be easily removed or repaired in place.

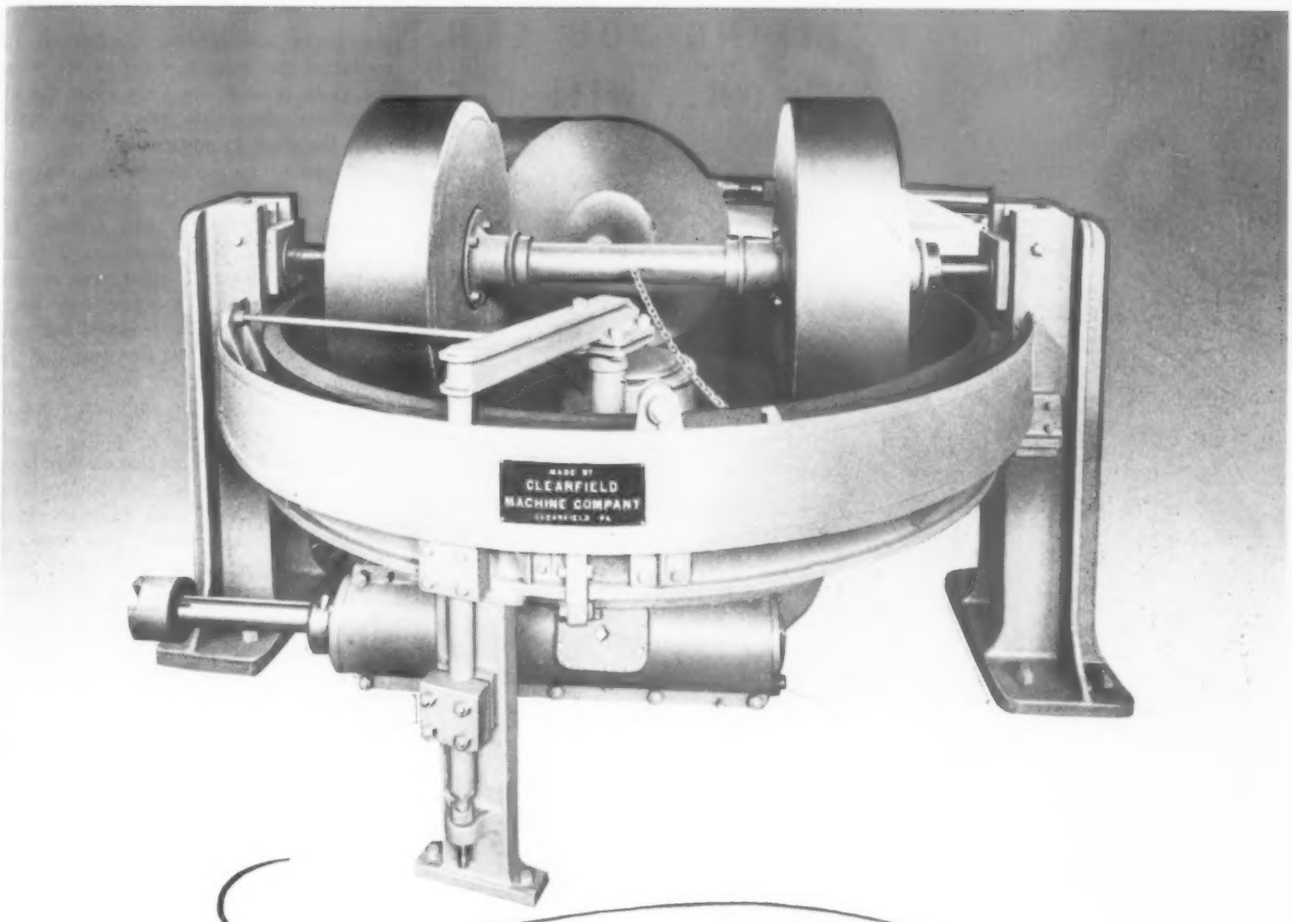
Although only a single type of shakeout hood for ventilation purposes is shown, several types are in common use. Ventilation units may be divided into three classes: down-draft, totally enclosed and canopy. That shown is the half canopy type. Obviously, a second hood may be located directly across the shakeout from that shown to produce a full canopy hood; however, its use is restricted by the mold handling device used.

Factors Affect Type of Hood

Type of hood elected for a given shakeout depends upon such factors as mold handling devices in use; method of molding which sometimes involves the use of two or more men around the shakeout to retrieve the castings, flasks and bottom plates; volume of air available for ventilation, and size of flask.

Where no overhead restrictions can be employed the down draft shakeout must be used. This type of ventilation involves the largest air movement. Some state laws specify a minimum of 400 cu ft of air to be removed per square foot of grate area per minute. This would mean the removal of 16,000 cfm for a 5 x 8 ft shakeout. Air velocity through the grate would be considerably higher than 400 ft per min due to a large area of the grate being covered by the sand, castings and flask. Ventilation of the grate by this method is very spasmodic. Full volume of air is removed when the grate is clear and is practically shut off when the flask first is dumped onto the grate. The dust escapes into the upper part of the room above the shakeout and then spreads throughout the building to contaminate

(*Continued on page* 214)



The Clearfield Mixers

ELIMINATE INACTION

Continuous, rather than intermittent action is one of the outstanding advantages of the Clearfield. Every instant of operation is accomplishing useful work. The revolving pan applies centrifugal force and the sand is in a constant state of agitation. It is thrown to the side of the pan and is bounced back to the center to be worked and tempered by the agitator and mullers. The proper mixture of sand, moisture and bonding agent is quickly achieved. Write for catalog No. 77.

Illustrated is the No. 920 Mixer with a capacity per charge of 20 to 25 cubic feet.

Four sizes available, Nos. 404, 610, 920 and 930 with capacities ranging from 4 cu. ft. to 40 cu. ft. per batch.

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MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U. S. A.

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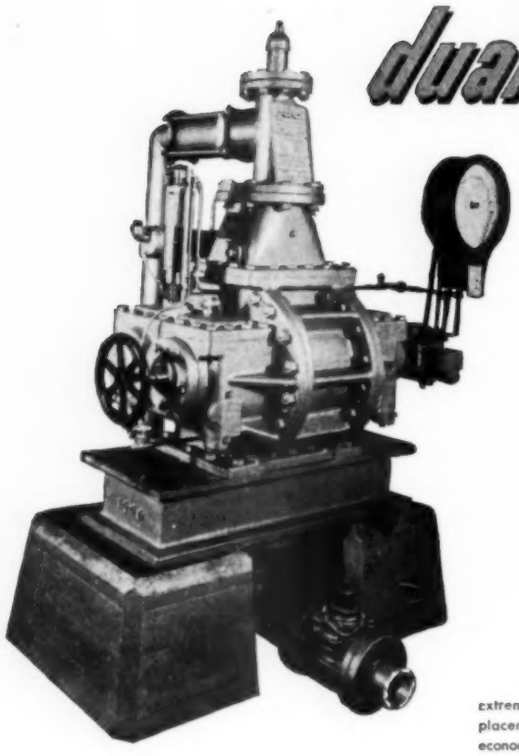

R-C Positive Displacement Meters accurately measure from 5% to 150% of their normal ratings.

ROTARY POSITIVE

extreme simplicity of R-C Rotary Positive Displacement principle enables you to account economically for every cubic foot of gas metered through these units.

• You get accurate measurement of gas or liquid with Roots-Connersville Positive Displacement Meters.

Accuracy is assured by the simple, correct design of the meter, with its absence of small parts, impossibility of tampering and complete freedom from adjustments.

This simplicity naturally leads to low cost per cubic foot of measuring capacity and extremely low maintenance cost over many years. Combined, R-C accuracy and low cost metering give you *dual-ability* not obtainable in any other meters.

Ask for Bulletin 40-B-13, or for engineering assistance to select the correct meter for your specific needs.

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One of the Dresser Industries
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ROTARY POSITIVE GAS METERS

ROTARY POSITIVE AND CENTRIFUGAL BLOWERS • EXHAUSTERS • BOOSTERS
LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

(*Continued from page 212*)

the entire atmosphere. Continuous removal of the large amount of air when the grate is clear does not clear the atmosphere adequately since cross drafts hold the dust in suspension.

Objections to the downdraft shakeout may be overcome by installing a somewhat larger shakeout than actually required under normal operation. This always will maintain a clear area around the heap of sand, castings and flasks through which the air required for ventilation may pass. Thus the dust may be captured and removed before passing beyond the area of the ventilating equipment.

The second type, the half canopy hood shown in Fig. 3, does not reduce materially the amount of air handled since, where a state law governs, the same figure of 400 cfm per sq ft of grate must be used unless the hood extends around three sides of the shakeout. It is agreed, however, that the side or canopy hood has an advantage in that closing of the grate area does not affect the amount of air removed by the collector system. It also presents the advantage of capturing the dusty atmosphere at some distance above the grate, thus preventing escape of dust into the room where adequate air is handled.

Ventilation Failure May Result

Amount of air to handle for ventliation of the shakeout by the half canopy hood depends upon the size of the shakeout, height of the hood above the grate and the amount of enclosure permitted. If three sides can be enclosed, less than 400 cfm per sq ft of grate area may be used. However, even with this amount of air being removed, the top of the hood may be placed so high that ventilation failure may result due to influence of cross drafts and convection currents.

Fig. 2 discloses a suitable design for the 5 x 8-ft shakeout operating under normal conditions with respect to counter currents from open windows and doors. In this view the shakeout is shown at *A*, the half canopy hood at *B*, duct connection at *C* and back shielding at *D*. The open area around the hood is designated as *E* across the front and *F* for the two ends. Height *G* of the hood above the shakeout is taken arbitrarily as 5 ft, although it could be any dimension required by the specific installation. The hood angle is set at 45° and the front edge of the hood is dimension *H* or 6 in. from the centerline of the shakeout. Dimension *E* then would be 7 ft 8 in., and since the length of the shakeout is 8 ft and the hood should extend at least 6 in. beyond each end, the hood would be 9 ft long. Open area at the front of the hood would be 7.6 x 9 ft or 68.4 sq ft. Open area at each end would be 22.5 sq ft or

45 sq ft for the two ends. Total open area would be 113.4 sq ft.

Experience with many shakeout installations indicates that for average conditions the velocity across the shakeout of this size should be 160 ft per min. Volume of air to be handled from the shakeout therefore would be 160 x 113.4 or 18,144 cfm. This is in excess of that specified for the downdraft installation. However, it is readily conceded that this method will provide far better ventilation than the downdraft using even more air. Usually it is possible to close the ends of the shakeout somewhat and in many installations one end may be closed entirely. Suppose, for example, the end sheet could come around to close 1 ft of the shakeout. This would deduct 11 sq ft of open area. If this could be extended to 2 ft, it would deduct 24 sq ft and thus reduce the total amount of air required to 16,384 cfm and 14,304 cfm, respectively.

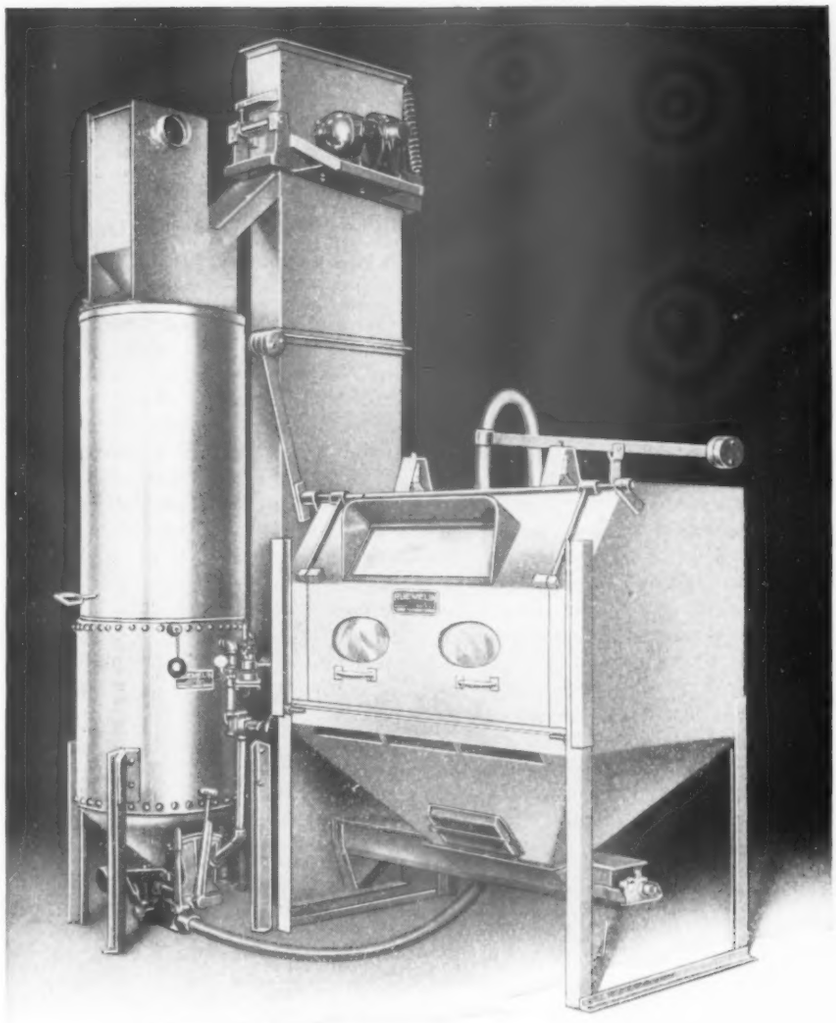
Additional types of shakeout ventilating hoods will be described in future articles.

Plan Large Foundry For Brazil

E. R. Steinmann & Associates, Brooklyn and Chicago, have been retained by Ricardo De Matos and a group of Brazilian industrialists to build, equip and manage a gray iron foundry in Rio de Janeiro, Brazil. The foundry, to cost approximately $750,000, will make castings for the plumbing, heating and ventilation supply industry and do specialty and jobbing work for the automotive, railroad and textile industries. Said to be planned as the largest on the South American continent, it will have a projected capacity of 1000 yield tons per month. The latest type of ventilating and cooling systems will be installed. Equipment will include a system of continuous conveyors for molding, pouring, grinding, cleaning, inspection etc. Ground-breaking ceremonies for the project are planned for about April 1.

Opens New Canadian Section

International Nickel Co. of Canada Ltd. has opened a development and research section at 25 King St. West, Toronto, Canada, to extend to Canadian industry a complete consulting and technical service on metal problems. Dr. Gordon S. Farnham, until recently, chief metallurgist, Department of Mines, Ottawa, A. S. Tuttle, formerly with the Metals Control, Ottawa, and H. J. Butterill, who during the war was chief design officer, British Ministry of Supply, will staff the new office.



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Ruemelin Blast Cabinet provides a fast cleaning action by direct pressure blast. Handles a great variety of jobs. Simple to operate. No skilled labor needed. Sanitary. Operator need not wear helmet. Front door loading. Saves footsteps and floor space. Low maintenance cost. No pits or foundation required. Shipped assembled for low installation cost. Handles all classes of abrasives. Over 1,000 in service in foundries, welding shops, steel treating plants, airplane factories, etc.

Write for Bulletin 32-B.

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Nonferrous Cost Accounting

This is the last of three parts of the "Simplified Accounting Procedure and Cost Methods" prepared by the Non-Ferrous Founders' Society as a guide in cost determination by foundries. Preceding installments appeared in the February and March issues

METAL LOSS: This can best be determined by the following formula: Weight of good castings in finished form plus weight of gates, sprues, and risers divided by the total weight charged into the furnace.

It is recommended that several test runs be made to arrive at this percentage, and also that different precentages be used on the following classes of material:

(a) Red metal group (red brass, gun metal, phosphorous bronze, silicon bronze).
(b) Yellow metal group (yellow brass, naval brass, manganese bronze).
(c) Aluminum (including aluminum bronze and aluminum manganese bronze).
(d) High nickel metals (Monel, Everbrite, etc.).
(e) Mangnesium.

If these test runs are made accurately, it makes little difference if a percentage figure is adopted or if a standard pound price to cover loss and shrinkage is used.

Estimating: With all these cost factors tied down, it is now possible to develop a standard type of estimating sheet to cover all these elements. Exhibit K is a form of estimating sheet which we recommend for adoption. While this is more detailed than this simplified system suggests, it is still usable under both setups—the simple system and the more expanded one.

Cost—Chart of Accounts:

40. Raw Materials—Inventory
41. Virgin metals, purchased ingots, purchased scrap, special alloys, shop scrap, returns, including freight and cartage on all metal purchases.
90. Labor—Distribution
91. Melting
    a. Unloading, sorting and storing labor—sampling inspection.
    b. Melting dapartment labor—handling metals and scrap—making up charges, melting, repairing furnaces, metallurgists or chemists time spent on metals.
92. Cores
    a. Direct labor of coremaker, apprentices, coremaker helpers, venting, blacking, pasting, assembling, filing, rubbing, gaging, etc.
93. Molding
    a. Direct labor of molders, apprentices, molder helpers, skin drying or core setting.
94. Cleaning
    a. Direct labor of trimming, cutting off gates and risers, tumbling, rough grinding, sand blasting, pulling, removing cores, filing, etc.
95. General and Miscellaneous
    a. Pour off help.
    b. Preparing molding sand.
    c. Mixing facing.
    d. Transporting sand or casting.
    e. Delivering patterns, flasks, bottom boards, gagger or other supplies.
    f. Maintenance labor.
    g. Foreman and clerks.
    h. Truckers.
    i. Shipping or receiving room help.
    j. All other miscellaneous labor.
100. Expense Distribution
101. Meltiing
    a. Fuel, coke, electricity, coal, oil, gas, etc., including freight and cartage.
    b. Refractory material, crucibles, fire clay, firebrick, insulating materials, stopper, nozzles, etc.
    c. Fluxes, oxides, glass.
    d. Outside physical and chemical laboratory charges.
    e. All other supplies used in melting.
105. Other Supplies and Expenses
    a. Repair to buildings.
    b. Repairs to machinery and equipment.
    c. Compensation insurance.
    d. Payroll taxes.
    e. Vacation expense.
    f. General power, light and heat, including core oven.
    g. Supervision and clerical costs.
    h. Administrative cost.
    i. Selling cost.
    j. Molding sand, core sand, including

EXHIBIT "K"

ESTIMATE SHEET—COST CARD

Customer _____

Pattern No. _____ Date _____

Description _____

Pattern Equipment _____ Flask Size _____

Core Equipment _____ No. of Cores _____

Weight Each _____ No. per Mold _____ Est. No. Molds per Day _____

Metal Cost	$		
Alloy Cost	$		
____% Shrinkage	$		
Metal Cost			$
Melting Labor	$		$
Melting Expense	$		$
Total Metal Cost			$
Molding Labor	$		
Core Labor	$		
Cleaning Labor	$		
General Labor	$		
Total Labor			$
Expense	$		
	$		
	$		
	$		
	$		
	$		
Total Expense			$
Total Cost			$
____% Profit			$
Selling Price Ea. or Lb.			$

freight and cartage.

k. Special compounds used in molding and cores.

l. Chaplets, chills, clamps, gaggers, nails, shovels, riddles, brushes, airhose and fittings, rammers.

m. Flask repairs, bottom boards, etc.

n. Pattern expense—not chargeable to customer.

o. Core oil and compounds, molasses, rammers, etc.

p. Repairs for core equipment—not chargeable to customers.

q. Grinding wheels, saws, files, acids, etc., sandblast supplies, etc.

r. Office and shipping room supplies.

s. All other supply and expense items.

BALANCE SHEET ACCOUNTS AND DEFINITIONS

Assets

10. Cash
    (a) Petty Cash
    On hand with some appointed person or persons at the location as part of invested capital or cash sales, or on hand awaiting deposit.
    (b) In Banks
    Unrestricted deposit accounts with banks as part of invested capital or subsequent deposits.
    (c) Cash—Subject to Restriction
    Receipts of advance payments.
    (d) Time Deposits
    (e) Marketable Securities
    Investment by the company in government securities, tax anticipation notes and other temporary investments for which there is a ready market.
    (f) Other Investments
    Investment in other stocks and bonds by the company.
    (g) Sinking Fund
    Cash and securities deposited to redeem company stock or bonds.
11. Inventories
    (a) Raw Materials
    Book, estimate or physical amount of raw materials used in direct manufacture priced at purchase price or other approved pricing method.
    (b) Work in Process
    Book, estimate or physical amount of semi-finished work (castings made not cleaned and ground) and not ready for shipment, priced at an adopted method of costing.
    (c) Finished Stock
    Book, estimate or physical amount of finished castings ready for shipment, or made for stock or on consignment, priced at an adopted method of costing.
    (d) Supplies
    Supplies, repair parts, non-durable and semi-durable, tools new and unused only.
12. Notes and Accounts Receivable
    (a) Customer Accounts Receivable
    Due on billings represented by regular company transactions.
    (b) Customer Notes and Acceptances Receivable
    Customer short term notes and trade acceptances owned by the company taken on billings and/or other types of transactions.
    (c) Due from Officers and Employees.
    Loans, advances, etc. to employees.
    (d) Accrued Interest and Dividends Receivable
    Interest and accrued and receivable on bonds or notes held by the company, declared and receivable dividends on stock.
    (e) Sundry Debtors
    All other receivables within one year.
13. Land and Buildings
    (a) Land
    If possible on the original purchase an appraisal of the value of the land separate from any building or property should be made—this to include any surveying fees, or assessments due at time of purchase—cost of clearing, removing or demolishing buildings—grading or filling (except that done in connection with erection of new buildings) roads—driveways—sidewalks and attendant engineering costs—this does not include the cost of maintaining the grounds.
    (b) Buildings
    Portion of the original purchase price of the building proper. Cost of permanent additions to the original structure or all new buildings on the land, including cost of engineering and architect's services, excavations, foundations, grading and filling around buildings, permanent partitions, fire escapes or ladders, crane runways, floor plates as part of the floor and connecting bridges from one building to another.
    (c) Structures
    Cost including that of excavations, foundations, grading for all permanent structures outside the buildings, such as canopies, rough open sheds, bins, yard racks, storage tanks, reservoirs, (above or below ground), cisterns, wells, fences, outside crane runways, bridges, tunnels, etc.
    (d) Piping and Wiring
    Cost including transportation and installation of all permanent main water lines, drainage and sewer pipes, electrical conductors and their fittings from point of distribution to connection at point of use, including subways and ducts for such piping and wiring. Cost including transportation and installation in all buildings and structures of all plumbing and toilet fixtures, gas,

101

Grinding Questions Answered

By Allen Steele, Manager, Dayton Grinding Wheel Division
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air, oil, and hydraulic pipes and their fittings and hose connections from pipes to their point of use—cables, and wire for power and lighting circuits, including sockets, receptacles, switches, cut-offs, insulators, conduits, and mouldings for wires.

(e) Sprinkler Systems
Cost including installation of all sprinkler pipes and fittings if not included in (d).

(f) Heating—Ventilating and Air Conditioning cost, including that of foundations and installation of permanent building heating, ventilating, and air conditioning systems and permanent additions thereto, covering steam heating mains, smoke exhaust ducts, hoods, oven blocks, etc. used in heating and ventilating the buildings and not covered in (d), also hoods placed over grinders and other equipment with piping, etc., for carrying off abrasive, brass and other deleterious dust. (This account should not be confused with items such as pumps, fans, exhausters, ovens and motors which properly belong in Machinery and Equipment.)

14. Machinery and Equipment

(a) Machinery
Cost, including transportation, foundations, any engineering cost and installation of machines with comparatively long useful life—such as any machine tool, elevators, cranes, hoists, conveyors, pumps, compressors, accumulators, blowers, engines, boilers, stokers, stationary and portable scales, etc. Includes cost of only those attachments which are necessary for the proper functioning of the unit and which are a permanent and integral part thereof, such as safeguards—oil and water feeds, shafting, foundations, etc. (This does not include semi-durable and non-durable tools, electrical apparatus, shop fixtures and equipment, automobile and other equipment, molds, jigs, punches, dies for machining or other fabrication—motors or office machines.)

(b) Electrical Apparatus
Cost, including transportation and installation of electrical apparatus, such as motors which are directly connected, geared or belted to any equipment, or connected to line shafts; motor generators sets, transformers and switchboards. (This does not include semi-durable and non-durable tools, repair or replacement parts for electrical equipment.)

(c) Ovens and Furnaces
Cost, including transportation, foundation and installation of ovens, heating and melting furnaces, baking and drying ovens, core ovens, annealing furnaces and boiling tanks, including their equipment consisting of pipes, flues, stacks, heating coils, grates and oil and gas burners.
(This does not include masonry flues, ducts and stacks, which are a part of buildings and motors incidental to ovens and furnaces, blowers, fans, exhausters, pumps, etc. which are a part of machinery or other accounts.)

(d) Shop Fixtures and Equipment
Cost, including installation of shop fixtures and equipment, such as work benches, racks, bins, lockers, stockroom fixtures, partitions not part of buildings, enclosures in shop, shafting, hangers, pulleys, couplings, etc.

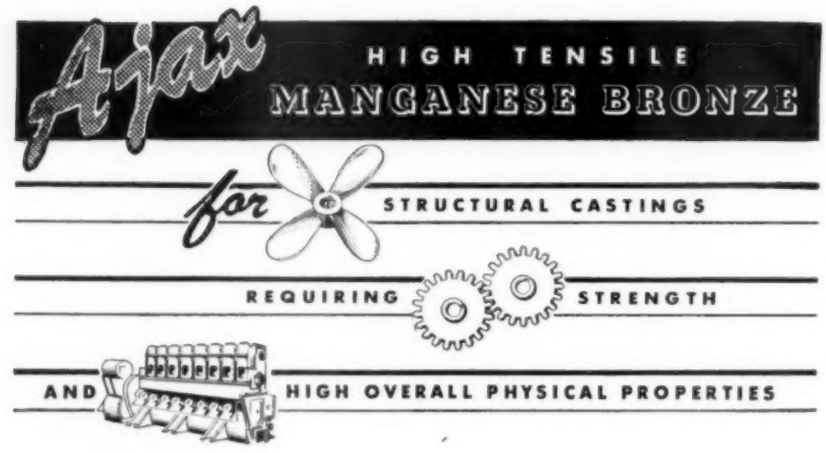
(e) Tools and Instruments
Cost of a normal or working complement of the smaller but essential standard tools of a portable nature, non-durable and semi-durable, which have a comparatively long and effective life, includes small portable power tools as pneumatic hammers or rammers, drills, chippers, etc.; electric drills and grinders and motors inseparably connected to such tools; also small hand power bench tools and other small tools and equipment not chargeable to indirect factory expense. Metal flasks and snap flasks; metal arbors and core boxes. (This account should not be charged with tools that are used in special product manufacture. It does not include maintenance or replacement items.)

(f) Transportation System
Railway tracks and structures. Costs, including foundation and installation of all permanent railway tracks in shops and yards, whether standard or narrow gage, turntables, overhead equipment of electrical railways, such as poles, trolley wires, guy wires, insulators, crossovers, brackets, suspensions, etc. and cost of all permanent additions to such equipment. Cost of steam or electric locomotives, steam shovels, cranes, flat, dump, box or push cars—motors and accessories attached to any of this equipment.

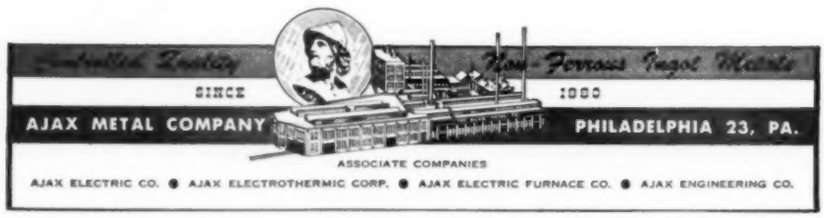
(g) Automotive Equipment
Cost of all automobiles, trucks, carts, wagons, or other conveyances.

(h) Furniture and Office Equipment
Cost of including any installation of furniture in factory, administration and sales office, such as benches, tables, desks and chairs, filing cabinets, bookcases, cupboards, lockers, safes, fans, lamps and floor coverings. Cost of including any installation of office appliances in factory, administration and sales office, such as adding, calculating and accounting machines, typewriters, duplicating and addressing machines, check-writers, etc.

(i) Fire Protection Apparatus
Cost including installation of all fire protection systems, such as fire alarms, watchman's clock system, hook and ladder trucks, hose wagons, hose lines and nozzles and chemical extinguishers. (This does not include any part cov-



Designers and foundrymen, charged with the gigantic responsibility of specifying engineering materials for the products of a world once again at peace, are closely scrutinizing the widest range of selectable materials ever offered to industry. Of primary importance is the direct consideration of Performance; and, decisions thus made must, of necessity today, be tempered with new emphasis on total Cost. An alloy, therefore, which measures high in strength, toughness and corrosion resistance—which has cut its eye-teeth long ago on marine castings and fittings, engine bases, pump bodies, gears, etc.—yet permits the foundryman to produce solid castings perfectly free from surface imperfections and which leave the sand bright and clean—and will take a mirror-like polish—an alloy like that deserves investigation. A metal of such calibre is Ajax High Tensile Manganese Bronze. Produced under rigid laboratory standards to constant formulae, this Ajax ingot has established recognition as the highest quality manganese bronze available. Write for complete data NOW.


SINCE
1900
AJAX METAL COMPANY
PHILADELPHIA 23, PA.
ASSOCIATE COMPANIES
AJAX ELECTRIC CO. ● AJAX ELECTROTHERMIC CORP. ● AJAX ELECTRIC FURNACE CO. ● AJAX ENGINEERING CO.

ered by a sprinkler system.)

(j) Patterns, Drawings, Patents, Development and Good Will

Covers the complete development cost including all engineering, drafting, pattern cost, tools and models both direct and indirect cost—alteration and change in design—labor and expense of testing, correcting products process of development, licenses, and royalties paid for right to manufacture, payments on judgment for infringement of patent rights, expense either before or after shipment to eliminate causes for failure of product to operate satisfactorily where failure is due to design.

Permanent pattern and production equipment of such development when their general acceptance becomes a part of the normal complement of the work performed and used in standard manufacture.

(k) Other Miscellaneous Assets

Liabilities

20. Capital Stock
    (a) Amount of invested capital.
    (b) Par or stated value of shares outstanding.
    (c) Treasury stock authorized but reacquired at cost of acquisition—until retired or reissued.
21. Notes and Accounts Payable
    (a) Trade accounts payable, face amounts of accounts arising from purchases.
    (b) Notes payable to banks, face amount of outstanding short-term notes discounted with or otherwise held by banks, maturing within one year.
    (c) Trade notes and acceptances payable, face amounts of outstanding notes and acceptances arising from commercial transactions and maturing within one year.
    (d) Mortgages payable—face amount of outstanding mortgage indebtedness maturing beyond one year.
    (e) Bonds payable—face amount of outstanding bond issues, except those maturing in one year.
    (f) Other long-term debt—long term notes and other indebtedness outstanding not otherwise provided for.
22. Reserves—Taxes
    (a) Accrued taxes other than federal taxes on income of all federal, state and local taxes.
    (b) Reserve for federal income and excess profits tax. Accrual of estimated liability for federal income and excess profits tax.
23. Reserves—Other
    (a) Accrued payroll—wages and salaries from last payroll to close of the period.
    (b) Accrued interest payable—Interest accrued on bonds, debentures, notes and other company indebtedness.
    (c) Long term debt due within one year—face amount of liability on serial or other notes, bonds and mortgages maturing in one year.
    (d) Reserve for vacations—this account is credited with estimated vacation allowances and charged as such allowances are paid.
    (e) Reserve for possible future inventory losses. Amounts accumulated by periodic deductions from income to cover future inventory losses.
    (f) Reserve for insurance. If insurance is carried by an outside company for a specific hazard this cost is usually absorbed in current operating expense. If a fund is accumulated by periodic deductions for items not covered by specific insurance coverage it is shown as a liability under this heading.
    (g) Other accrued liabilities. Any accrued expense such as royalties, commissions, legal and accounting fees, etc.
    (h) Advance payments received on sales contracts. Cash, face amount of notes, or other settlement received on account of contracts or order prior to shipment and billing.
    (i) Advances from stockholders, officers, directors or employees.
    (j) Dividends payable—declared and unpaid upon company's outstanding stock.
    (k) All other contingencies—items not specifically covered in previous accounts.
24. Surplus

    Accumulated net incomes, less dividends declared and other amounts reserved.

In the asset section of this chart of accounts, the items under the main classification of "Land and Buildings" and "Machinery and Equipment" require a further step to reflect a true current condition picture. To do this by accounting we employ through our records a depreciation factor which covers the unused useful life of the asset.

For example, in the case of "X" Company, in the "Land and Building" account, it has been determined that the land was worth $500.00 and the buildings $1000.00. If the economic condition in a community remained the same the land values would not be affected over several years of use by depreciation. The building, on the other hand, assuming it had an estimated useful life of 25 years at time of acquisition would be depreciated at the rate of 4 per cent per year. At the end of ten years of operation the net building value could only be 60 per cent of the initial cost.

Contra to this, any cost incurred on rehabilitation of an asset, which is the restoration through extensive repairs and overhauling and adds useful life to the assets, may be capitalized. The amount of this expenditure at the time of improvement can then be spread over the remaining useful life of the asset and a depreciation charge determined for this improvement.

ELECTRIC MELTING of ALUMINUM ALLOYS

No Longer a Luxury

Aluminum alloy iron-core induction melting furnaces, the first of this kind capable of continuous operation, have been developed at Ajax's Experimental Foundry (see photo upper right). Simplified cleaning methods and improved design of melting channels have resulted in increased lining life and reduced maintenance cost.

Job of melting 300 pounds per hour requires 60 kw. unit (see photo above) occupying about 4' x 4' x 4' space, requiring no foundations and provided with a self-contained internally wired control cubicle, including potentiometer type temperature controller. Operating cost from 40 to 70 cents per hour, with maintenance items almost negligible.

Another unit of 20 kw. capacity is finding wide acceptance as holding furnace in die casting and permanent mold work. Space required is about 3' x 3' x 3', no foundations, self-contained control cubicle. Operating cost from 8 to 12 cents per hour. Metal charge of crucible is 300 pounds.

X-ray investigation carried out on metal processed in Ajax induction furnace proves that accurate (free of time lag) temperature control, typical of these furnaces, allows casting consistently at lowest and most adequate temperatures necessary for sound castings, all of which results in considerable reduction of rejects.

AJAX ENGINEERING CORPORATION
TRENTON 10, N. J.

AJAX TAMA-WYATT — INDUCTION MELTING FURNACE

Associate Companies: **AJAX METAL COMPANY,** Non Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Holtgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

MODERNIZATION OF FOUNDRIES

(*Continued from page* 89)

gist, a patternmaker who is a good rigger, a foreman who knows molding procedures, a man who knows cores and their application, and, in some cases, the chief inspector or his representative. Such a committee, functioning properly, will prevent many of the usual foundry troubles from recurring. Preventive medicine is less costly than corrective.

Procedures: Many foundries have established procedures requiring hourly or daily inspection of the scrap by the foreman, so that causes for scrap are analyzed and corrected as quickly as possible. Frequent recurrence of scrap for the same correctible causes is reason for an enforced vacation by the individual responsible for failure to correct the causes.

With the more competitive conditions which will develop in this postwar period, it is more important than ever that foundries establish and maintain control of the variables affecting production of high quality castings at low cost. Competition from other metals or products is encouraged by failure of castings consistently to do the job for which they are purchased.

Costs: There is no question but that foundries should know their costs of the various operations in the plant. Without such information it is difficult, if not impossible, to control costs and keep them near the optimum low level. With adequate cost information it is possible to put the emphasis on those operations or departments where unit costs are high, and to make the necessary changes in methods, procedures, personnel or facilities to secure the desired results.

The need to keep unit costs low should be emphasized. The sooner foundry management and foundry labor get together and work out a mutually satisfactory basis for a full day's wage for a full day's work, the better it will be for the industry. Labor cannot expect full pay for less than full effort because that is a sure road to higher costs, loss of business and, if continued, to failure.

Incentive System Faulty

The war period caused much careless and sloppy thinking as well as operating. For example, one plant has a small sand system with nine molders who produce an average of 157 molds per man in 10 hours. Under an "incentive" system these molders are paid an average of $16 to $18 per day. I am not familiar with all the circumstances that permitted such a condition to develop over the last 3 or 4 years, but I do know that unless the so-called "incentive system" can be rebased on realistic standards of production for that class of work, the foundry will be at such a competitive disadvantage it will not secure the work necessary to stay in business. The management has no objection to the men being paid $16 or $18 a day, but it does want the men to earn it by producing to capacity of 30 to 40 molds per hour instead of 15 to 17 per hour.

Management is partly to blame because, in this instance, the molder must do his own pouring, and observation has disclosed him waiting for sand, for molds to be shaken out so he will have space to put a mold, for metal to pour molds and for cores to set. Poor administration of the incentive system apparently resulted in increasing mold prices to the molder instead of correction of the interferences which reduced the capacity of the molder to produce. This is an example of what happens with modern facilities without modern thinking back of them, and without adequate engineering to eliminate the interference to full production.

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Another important factor influencing cost of production is, of course, the pattern and rigging of the job. The modern foundry is one where the engineering of the job is done before it ever gets to the molding floor. The pattern and rigging of the job will affect not only the molding, cleaning and finishing, but also the costs in the machine shop. The best mechanical equipment that money can buy will not offset inadequate or lack of proper pattern and rigging of the job. It should be pointed out that proper mechanical equipment allows much greater latitude and opportunity for rigging for lower unit cost. It also permits closer control of the variables affecting quality. The committee previously mentioned, when analyzing the best rigging for the job, can also decide how the old jobs may be re-rigged to permit standards requiring lower unit costs and higher unit production.

Improve Working Conditions

Because of the unfavorable—and unfair—publicity given foundries during the war, it was increasingly difficult to attract the type of help that is necessary to maintain the industry in its position relative to other industries. We must improve our working conditions and provide adequate personal services so that the foundry personnel may travel to and from the job looking just as respectable as the machine shop or office worker. The hot, dirty, laborious part of foundry operations have all been analyzed by the equipment companies, and labor-saving devices developed to assist and make the work easier. Dust and smoke, when collected at the source, are readily controlled and the hazard and discomfort greatly reduced or eliminated.

From my travels to some 1500 foundries in the United States and Canada, it is my belief that every foundry will have to modernize, and also mechanize to some degree, in order to stay in business, attract and keep the type and quality of labor and management it needs, and insure for management, labor and owners an adequate return for their effort and investment.

Facilities: The first step any foundry interested in mechanizing should take is an analysis and survey of each of the several departments in the plant, with a close check on methods and costs in each department. These departments include yard handling, melting, hot metal handling, molding, coremaking, baking, finishing and handling, shakeout, casting cleaning, finishing and handling. A layout of the entire plant as it now is, with existing facilities and operations clearly marked, should be made. Then, a layout of a rearrangement of existing facilities, with the addition of such new facilities as are economically justified, should be prepared. The idea, of course, is to secure straight-line flow of material with a minimum of rehandling, and to permit maximum unit production with lowest unit cost.

Most foundries have developed from a small beginning over a period of years by making expedient changes or additions demanded by changes in work. Very seldom has the overall layout been subjected to scrutiny and analysis. For example, a foundry was planning an addition to its plant to provide room for additional equipment and people in the cleaning room, which was badly cluttered up. A rearrangement of the facilities and the addition of two more grinding stands allowed 20 per cent more people to turn out twice the tonnage and no new building was necessary, and only a nominal expenditure was made.

After proper consideration of the overall layout, based on the mission the foundry is expected to accomplish, a detailed analysis of requirements and costs should be developed to illustrate

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Chicago, Ill	B. J. Steelman
Chicago, Ill.	Wehenn Abrasive Co.
Cincinnati, Ohio	Delhi Foundry Sand Co.
Coldwater, Mich	The Foundries Materials Co.
Detroit, Mich	The Foundries Materials Co.
Dallas, Texas	Barada & Page, Inc.
Edwardsville, Ill.	Midwest Foundry Supply Co.
Hammond, Ind	The Foundries Materials Co.
Houston, Texas	Barada & Page, Inc.
Kansas City, Mo	Barada & Page, Inc.
Long Island City, N.Y.	F. E. Schundler & Co., Inc.
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Los Angeles, Calif.	F. E. Schundler Bentonite Co. (Inc. of California)
Milwaukee, Wis	Thomas H. Gregg Co.
Minneapolis, Minn.	Smith-Sharpe Co.
Moline, Ill.	Marthens Company
New Orleans, La	Barada & Page, Inc.
Oklahoma City, Okla	Barada & Page, Inc.
Philadelphia, Pa.	Penna. Fdy. Sup. & Sand Co.
Portland, Ore.	Miller & Zehrung Chemical Co.
St. Louis, Mo.	Midwest Foundry Supply Co.
San Francisco, Calif.	Industrial Supply Co.
Seattle, Wash.	Carl F. Miller Co.
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Mexico D. F., Mexico	N. S. Covacevich
Montreal, Quebec, Canada— (All Provinces)	Canadian Industries, Ltd.

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the economies of the proposed changes. The foundry industry is a feast and famine business, hence any major expenditure should be self-amortizing in a relatively short period of time.

As a requisite in making such an analysis, I would suggest that any major expenditure be self-amortizing in direct savings in not more than 3 years of operation.

The encouraging fact is that most changes will pay for themselves in savings in labor and material in 12 to 30 months if properly engineered, installed and operated.

No foundry should jeopardize its working capital position to install additional facilities. That's a pretty sure way to lose control of your business. Banks are making term loans to foundries for capital equipment investment at very low rates of interest and reasonable terms.

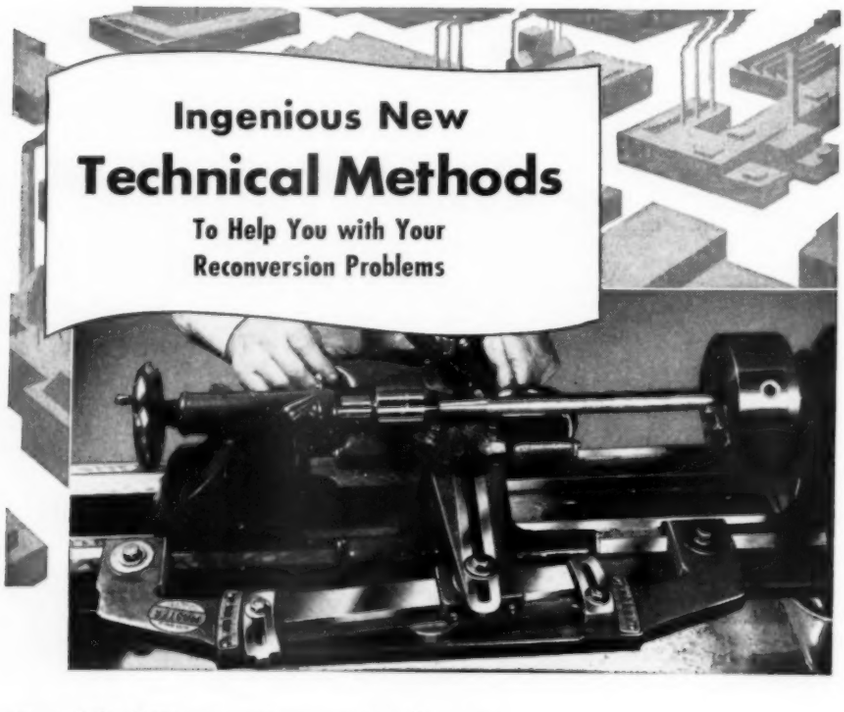
The modernization program should be taken piecemeal in a series of projects planned to fit the pocketbook, or else outside money should be used on a basis which will permit the savings to return the invested funds.

Great care should be taken in developing the plant layout to insure sufficient flexibility for the job to be done. Poor engineering or lack of sufficient study of detail requirements of the particular plant may vitiate much of the advantage of the modern facilities.

We may safely sum up by saying that every foundry must be constantly on the alert to modernize its thinking, methods and facilities in order to insure quality products at low unit costs.

No two foundries present identical conditions, so it is of paramount importance that the program be developed to fit the local conditions with sufficient flexibility to allow efficient operation under varying work loads. Until relatively recently the jobbing or production jobbing type of foundry has believed that modernization and mechanization was all right for production foundries, but could not be applied to its conditions. Some jobbing foundries did get into financial difficulties by trying to copy production equipment for jobbing equipment. Today, however, there are many modern, mechanized (to a degree) jobbing and jobbing production foundries that are highly successful because they have properly applied modern facilities and practices to their local problems.

Editor's Note: This article is from a talk given by the author before various AFA chapters and other technical organizations.



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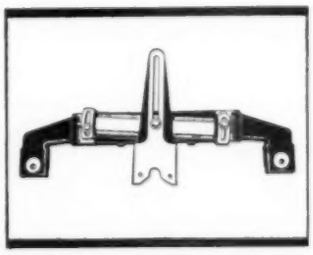

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AA-63

Sand Group Report Published

Foundry Sand and Mold Materials Committee of the Northern California Chapter of the AFA has published a report of its second year of activity, covering foundry sands on the West Coast, from Mexico to Canada.

The 175-page book contains a wide variety of laboratory reports made by Donald L. Mason of Stanford University, special sand charts, facing and mold wash preparations and general sand practice. The sub-committees on iron, steel and nonferrous sands and materials have reported on their experiments and conclusions. Four leading experts of national fame were invited to address the committee, and the substance of their speeches has been reproduced in the report. The speakers include Charles Schureman, L. P. Robinson, Emile Pragoff and Adrian C. den Breejen.

While many highly technical articles and charts fill a valued place in this report, it retains the flavor of a job done by foundrymen for foundrymen, and the small shop has not been overlooked. As long as copies are available they may be secured at $2 per copy, by addressing the chapter secretary, J. F. Aicher, 277 Seventh St., San Francisco 3.

WHAT THE WORKER THINKS

(*Continued from page* 83)

which throws more work on the other fellow, and unequal pay for workers on the same job.

"In the light of the severe criticism of foremen throughout the questionnaire, they are given a surprisingly good rating on the specific question, 'What do you think of your foreman?'

"The social and publicity programs of the company are rated highly by the employees and have a favorable effect on plant morale. The vacation plan receives considerable criticism on the basis that it should be longer and that unexcused absences are given too much weight in determining vacation credit.

"The employees are almost unanimous in thinking that the company should earn a profit, and the median average profit which is considered fair is 6.3 per cent on the investment.

"In general, the replies to the various questions have an overall consistency which shows that the employees know what is going on in the plant and have definite opinions on how the plant should be run—or at least their small part of it. The replies in toto also give the impression that a lot of poor management comes to light at the foreman level. There is evidence of too many bosses, disagreements in respect to policies, and breakdowns in systems and planning, all of which result in inefficient operation and affect the morale of the conscientious worker."

Breakdown of Report

Replies to the questionnaire were received from 300 men and 77 women. Of the responding men approximately 25 per cent were employed in the foundry, 10 per cent in the coreroom, 30 per cent in the machine shop, 13 per cent in supervision and 22 per cent in other departments. In the complete report the replies were analyzed not only by departments, but also on the basis of length of employment, marital status and age. Replies of the men were tabulated separately from those of the women. This sort of breakdown permitted the reaching of significant findings in certain instances which are not disclosed by overall data.

Since space does not permit a complete analysis of all the results of the study, the various questions are listed here with percentages of replies made by the men only. Some individuals made no reply to certain questions, consequently the percentages do not total 100 in all cases.

Questions 1 through 4 referred to length of employment, marital status, number of children, and department in which employed.

5. How do you feel about your present job? Fine, 47.2 per cent. Don't like it, 4.4 per cent. Okay, 28.7 per cent. Okay during war, 15.3 per cent.

6. As compared with what you might earn annually elsewhere at the same work, do you think your earnings are: Good, 26 per cent. Average, 52 per cent. Low, 21.3 per cent.

7. How do you think your regular hourly rate compares with rates of pay for similar work elsewhere? Higher, 11.8 per cent. About the same, 52 per cent. Lower, 28.2 per cent.

8. Are you generally in favor of the principle of the incentive or piecework pay plan? Yes, 56.2 per cent. No, 28.4 per cent.

9. If so, do you think the company figures its incentive pay fairly and accurately? Yes, 43.5 per cent. No, 23.6 per cent.

10. What do you think of working conditions here as compared with other similar plants? Above average, 15.3 per cent. Average, 62.3 per cent. Below average, 18.4 per cent.

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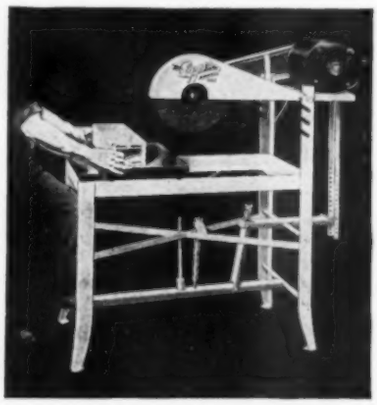

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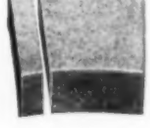
This concrete block, converted into a special size, was cut completely in two in 19 seconds.

One of the many intricate cuts performed on first quality clay brick for heat treating furnaces —made in 8 sec.



Rotary Kiln Blocks, cut to size for "key" bricks in rotary kilns, require only 10 sec. for completion of cut.

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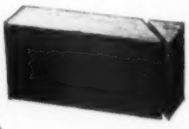

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11. About how many hours do you work per week? Are you working hours: Too long, 12.7 per cent. About right, 70 per cent. Too short, 11 per cent. (Note: At the time of the survey the majority of men were working 45 to 55 hours per week.)

12. How would you rate the company's efforts to provide safer working conditions? Good, 32 per cent. Fair, 47.3 per cent. Poor, 16.7 per cent.

13. What would you suggest to improve safety in your department? This question brought a variety of specific suggestions. The type mentioned most frequently referred to general maintenance, limitation of speed of tractors and jitneys, better ventilation, and clearing of aisles.

14. Considering current conditions, do you think the plant is kept in a neat and orderly condition? Yes, 26.6 per cent. No, 31.9 per cent. Mostly so, 39.2 per cent.

15. We think of morale as the good, bad or indifferent attitude or feeling that a person has toward his company in general, his job, his fellow workers, etc. How would you rate the morale in the plant? Good, 28.6 per cent. Fair, 57.5 per cent. Poor, 11.3 per cent.

16. What would you suggest to improve plant morale? Recommendations made most frequently in reply to this question were for better co-operation between senior and top management and labor, also between supervisors and employees; general cleanup in plant, such as inside painting, better ventilation, cleaner windows, etc.; better supervision; improvements in wage system; more recreational facilities and better eating facilities.

17. What do you think are the main causes of absenteeism in the plant? Drunkenness topped the replies to this one. Causes also mentioned frequently were: Lack of interest in work, sickness, too much money, fatigue, type of worker employed, long hours, laziness and poor discipline.

18. What would you suggest to lessen the percentage of labor turnover in the plant? The most popular suggestions were: Better co-operation between management and labor, higher wages, more careful selection of workers, and hiring of local help instead of "floaters."

19. Do you think your opportunities here for advancement and steady employment are better than at your last job? Yes, 38.3 per cent. No, 18.7 per cent. About the same, 34.7 per cent.

20. A company policy is to promote men from the ranks. Do you think this policy is carried out as it should be? Most of the time, 37 per cent. Part of the time, 40.3 per cent. Almost never, 13.3 per cent.

21. Do you think the company selects the best qualified people for promotion? Almost always, 30 per cent. Part of the time, 54.3 per cent. Almost never, 8 per cent.

22. From the standpoint of aggressiveness, fair mindedness, etc., how do you think the company management compares with that of other companies? About the same, 53 per cent. Above average, 25.7 per cent. Below average, 13.7 per cent.

23. A policy of the company is to modernize the plant's production facilities when and where possible. Do you think this will place us in a better competitive position with other firms after the war? Yes, 73.7 per cent. No, 1.7 per cent. Don't know, 18.3 per cent.

24. Do you think the company's present major modernization program will help to provide you with steadier work in the postwar period? Yes, 79 per cent. No, 9 per cent.

25. What new products, in your opinion, could we manufacture successfully after the war? Most suggestions covered: Automobiles and automobile parts, farm tractors and farm machinery, household appliances, motors, airplane parts.

26. How do you find your fellow workers? Friendly, 88.4 per cent. Indifferent, 8.6 per cent. Unfriendly, 1 per cent.

27. On the basis of ability, spirit of co-operation, personality, etc., how would you rate your fellow employees? Above average, 17.7 per cent. Average, 76 per cent. Below average, 3.7 per cent.

28. Do you associate with your fellow workers socially after working hours? Yes, 52 per cent. No, 39 per cent.

29. Do you think there is too much loafing in the plant? Occasionally, 37 per cent. Frequently, 25.3 per cent. Seldom, 21.6 per cent. Never, 10.3 per cent.

30. What do you think of your foreman? Does he know his stuff? Yes, 75.5 per cent. No, 15.8 per cent. Don't know, 8.7 per cent. Does he play favorites? Yes, 29.5 per cent. No, 56.2 per cent. Don't know, 14.3 per cent. Is he usually fair? Yes, 79.9 per cent. No, 16.7 per cent. Don't know, 3.4 per cent. Does he keep you busy? Yes, 92.5 per cent. No. 5.6 per cent. Don't know, 1.9 per cent. Does he keep his promises? Yes, 67 per cent. No, 23 per cent. Don't know, 10 per cent. Does he pass the buck? Yes, 28.2 per cent. No, 52.5 per cent. Don't know, 19.3 per cent. Does he welcome suggestions? Yes, 69.1 per cent. No, 17.6 per cent. Don't know, 13.3 per cent. Is he a good teacher? Yes, 66 per cent. No, 26.1 per cent. Don't know, 7.9 per cent.

31. Do you think the company sports recreation program is: Too big, 3.3 per cent. Not big enough, 21 per cent. About right, 57.3 per cent.

32. Concerning the various recreational groups sponsored by the company, are you: Actively taking part, 15 per cent. Mostly a spectator, 38.3 per cent. Not interested, 29.7 per cent.

33. What activity would you like to see included in the recreation program? Those answering this question seem pretty well satisfied with the present recreational program.

34. Considering rationing, help shortages, and other wartime conditions, do you think the food served in the cafeteria is: Almost always good, 5 per cent. Good most of the time, 15 per cent. Satisfactory, 23 per cent. Unsatisfactory, 47.7 per cent.

35. Do you think the prices charged are: About right, 30 per cent. Too high, 60.7 per cent.

36. Through bulletin boards, posters, *Wilfamco*, etc., do you think the company makes a proper effort to keep you informed about its business? Almost always, 56.3 per cent. Part of the time, 31.3 per cent. Almost never, 4.7 per cent.

37. Do you, or other members of your family, listen to the daily Wilson news broadcast over WGAR? Regularly, 18.7 per cent. Sometimes, 56 per cent. Never, 19.3 per cent.

38. Do you read *Wilfamco News*? Regularly, 78.7 per cent. Sometimes, 16.3 per cent. Never, 1.7 per cent.

39. What kind of stories are you chiefly interested in seeing printed in *Wilfamco News*? News about company business, fellow employees and men in service received the most preference.

40. Are you fully informed as to the benefits you can obtain under the company's group insurance program? Yes, 69 per cent. No, 23.3 per cent.

41. The company grants one-half day vacation credit for each calendar month worked without unexcused absence. (A full day is granted to those with 5 years or more service.) Do you think this vacation plan is a fair one? Yes, 75.7 per cent. No. 17 per cent.

42. Do you hope to stay with the company after the war? Yes, 83.7 per cent. No, 8.3 per cent.

43. Do you feel you have a dependable future with this company? Yes, 67.4 per cent. No, 14.3 per cent.

44. Do you think your company's standing in the community is: Improving, 84.7 per cent. Standing still, 8 per cent. Getting worse, 2 per cent.

45. In your opinion, what is the most serious condition this company and its employees must overcome after the war? Lack of employee interest, 20.3 per cent. Absenteeism, 18.9 per cent. Poorly trained foremen, 16.2 per cent. Poor management, 12.1 per cent. Turnover, 12.1 per cent. Poorly trained workers, 10.7 per cent.

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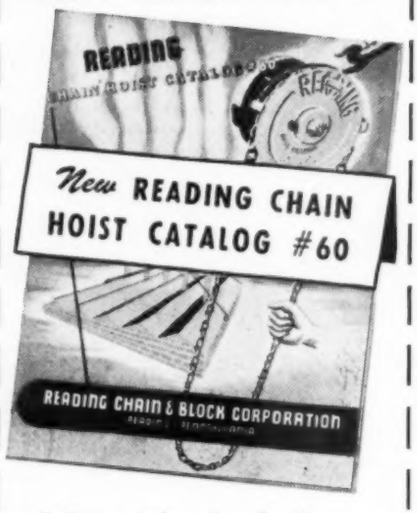

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46. Do you think the owners of the company should earn a profit? Yes, 91.7 per cent. No, 2 per cent.

47. If you had your savings invested in the company, what would you consider a fair rate of return on your investment? The majority of replies mentioned a figure between 4 and 10 per cent return. The median average was 6.3 per cent return.

48. What do you like least about the company? Most of the answers here were too general to have much specific significance. Principal complaints referred to poor management, lack of co-operation and understanding of workers' problems, unsanitary working conditions (poor air), and unfairness in time studies and the wage systems.

49. What do you like most about the company? Answers to this one likewise were general. Predominant was mention of fairness and friendliness from the top down. Also given frequent approval was the interest taken in the workers and the actions of superiors, general working conditions, and the progressiveness of the company.

50. What should the company do for its employees that is not already being done? Outstanding comments referred to need for improvement of working conditions, better wages, and more individual interest in the worker that will check individual abilities and promote accordingly.

51. If you were president of this company, what steps would you take to improve the plant or any phase of its business? Most replies to this question merely re-emphasized unsatisfactory conditions mentioned elsewhere in the questionnaire and which the respondents would proceed to correct.

Book Review

Uranium and Atomic Power, by Jack DeMent and H. C. Dake, 343 pages 5¼ x 8½ inches, published by the Chemical Publishing Co. Inc., Brooklyn 31. Price $4.

This is the second edition of a work written from the practical viewpoint to give the layman, student and other interested parties information essential to an understanding of atomic power. It is composed of seven chapters and eight appendixes. First chapter deals with structure of the atom and atomic power possibilities. Chapters 2 and 3 describes uranium minerals and prospecting for them. Physics and chemistry of uranium are discussed in Chapters 4 and 5, while methods of uranometry or detection and determination of uranium are considered in Chapters 6 and 7. The several appendixes contain tables and a brief discussion of the atomic bomb.

New Film Depicts Aluminum Uses

Widespread use of aluminum in winning the war, and the many new and improved applications developed as a result of wartime needs, all serve to vastly broaden the role of this metal in peacetime production.

As a result, the Jam Handy Organization has produced for the Aluminum Co. of America a sound motion picture based upon this theme. It is titled "Dateline—Tomorrow." This picture is being projected without cost or obligation by the sponsor, with special attention to audiences composed of buyers, designers, fabricators and sellers of products which include, or could include, aluminum.

Primary purpose of the film is to show the qualities and characteristics of the various aluminum finishes over a wide range of applications.

Second, to highlight enough of the methods of securing various types of finishes so as to give those who see the picture a basis for comparing suitability and cost.

Technical Service Is Offered

International Nickel Co. Inc., New York, has opened the Twin Cities technical section of its Development and Research Division, at Minneapolis, where technical assistance will be furnished to industry in Minnesota, North and South Dakota, northern Wisconsin and northern Michigan. J. C. Neemes Jr., metallurgist, who formerly was assicated with Steel Sales Corp., Chicago, as foundry engineer, and the Carnegie-Illinois Steel Corp., Chicago, as alloy contact representative, will have charge of the new office.

Grede Marks 25th Anniversary

Grede Foundries Inc., Milwaukee, has published a beautifully illustrated 58-page folder, entitled "Grede Foundries, A Quarter Century of Foundry Progress." Photographs and text give information on the production facilities of the Liberty Division at Wauwatosa, Wis., the Milwaukee Steel Division at Milwaukee, the Smith Steel Division at Milwaukee, and the Spring City Division at Waukesha, Wis. Some of the various types of castings produced by the company are illustrated, and photographs show the personnel of the various plants and the men and women who have been connected with the organization for 25 years.

PROGRESS THROUGH RESEARCH

(*Continued from page* 106)

inherently less appreciative of the value of research than certain of the other branches of the foundry industry, but compared with steel and magnesium, gray iron is a slow third. That steel and magnesium are somewhat ahead in the research picture is not all to the credit of their respective industries. Steel castings, for example, were badly needed for naval service and this need was immediately apparent after World War I. The castings were used in fabrications operating under extremely severe service and their internal soundness and overall integrity at that time were poor. Furthermore, this was an infant industry and basic knowledge was almost nonexistent. Accordingly research was initiated, and the Navy's interest in steel castings and its support of their industry have been a powerful influence on the present "state of the art" in America.

Iron Has Been Neglected

Magnesium was also destined for favor by the war services, for reasons of which we all know, and under the impetus of development as a strategic war material great strides in its technology were made in a relatively short time. Perhaps another reason for the somewhat more favorable technological position of steel and magnesium as compared with gray iron is the relatively higher selling costs of the castings. It is no new idea that iron castings have been priced so low that no margin is left with which to pay for research. It is not properly within the scope of this paper to expand upon why this is so, but like the turtle who never gets anywhere unless his neck is out, let us venture a guess that price cutting at some time or another had something to do with it. Of course, no one in this generation is responsible but perhaps the blame can be placed on the broad shoulders of our ancestors. Some persons might feel that much research has been done and much money spent on gray iron research, particularly in England, but large as the expenditure of time and effort may have been it is still not enough.

To conduct research and prepare a report or a paper is only a small part of the job. An equally important phase is interpretation and application of the results. Herein is a very real challenge to industry which has not been met with vigor. It is no secret that a researcher, who has spent diligent effort in solving a

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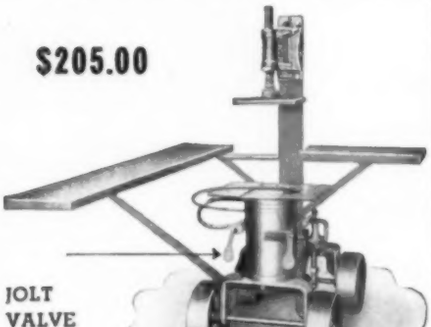

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problem in a practical and useful manner, will often be met with cold disfavor when his work is presented The reason for this is generally lack of appreciation of the value of technology in the foundry on the part of old timers who feel they have probably forgotten more about the foundry than this presumptive young chap will ever know. This is a common experience for researchers who have felt the cold shoulder of disbelief repeatedly.

Dr. Vannevar Bush's comment in defense of deferment for young researchers during the war is interesting. "Hell," he said, "we have to have these young men. None of us oldtimers know enough about the new theories and developments to carry on." His words, spoken in the early part of the war concerning atomic theory and radar development, were prophetic, and apply as much to the foundry game as they do to any other field. Science will pay as big dividends when applied to the making of iron castings as to the manufacture of airplanes or A-bombs. The biggest boost industry can give the transition to the scientific way is to get behind research with money and moral support. It will be necessary to hire technically-trained men, even if they are unfortunate enough to be both young and inexperienced. An open mind toward new ideas and methods is also the responsibility of industry, and perhaps it can be said with some truth that the foundry industry, considered as a whole, is slower than almost any other basic industry in adopting "new fangled" developments. It is probable that if the radio and radar industry, the aircraft industry and the atomic physicists had been as slow, Germany would have long since won the war.

Prepare To Meet Challenge

This does not mean that all foundries are decadent. To be sure, a few foundries have been progressive and to these may go the reward of postwar survival when the going gets tough. Quality such as many foundrymen have never dreamed possible of attainment is apt to be the keynote of the postwar casting, and the race will go to those who have prepared to meet the challenge. Many large foundries pose as champions of research and maintain large research staffs but this part of the organization is often a front, a window dressing expedient. Behind the scenes their foundry practices are as antiquated as others who have no research staff.

The observations made so far have not been particularly palatable. The best way to attract a foundryman's attention is to make a few sharp criticisms of his techniques or of his organization and then settle down to the main issues. For surely all the blame of slow development of foundry technology cannot be placed at his door. The foundry inherently is not an appealing place for the average student to work, and adopting the foundry game as his profession does not immediately strike his fancy. Accordingly, the average man entering school or about to start thinking of his career is not attracted by the romance of the iron foundry. Colleges and universities have not stressed this branch of their curricula. Although this perhaps should not be the foundrymen's responsibility he will have to assume it if maximum progress is to be made.

Many foundry executives are rising to the cause but the number is still too few. Scholarships and endowments by individual iron foundries or collective groups, cleaner foundries, open mindedness, progressive attitudes and overtures to colleges and universities can put future foundry technology on a thriving foundation. Too great emphasis cannot be put on these points. Surely their significance justifies repeated mention. The big and important issue now is to do something about them. Colleges and universities have not trained men for several years and are now busy developing their curricula. Now is the time to put in an oar and demand a fair share of attention. This could be done individually but preferably by a Society representing the collective argument of an organized industry, but in either event, should be done with enough vigor to put the program across.

Must Not Ignore Research

Scientific research, the life blood of progress, must not be ignored by the gray iron industry. The day of the rule-of-thumb foundrymen is about done and the scientific way must and will take over. The level of quality and production essential to survival in the postwar world will demand it.

Research can be conducted in several ways. Since fundamental long-range research is never economical of time or money and seldom promises an immediate practical return on the investment, small companies cannot enter into large-scale scientific development. They can, of course, conduct small-scale research upon the immediately pressing problems of their own shop by setting aside a few of their men and placing technically-trained personnel in charge, and much can be said for the advantages of this effort. However, results from this type of research seldom finds its way into scientific journals and seldom if ever are the answers obtained fundamental enough in nature to be useful in the solution of other similar problems.

Basic research of the type productive of the greatest overall good for any given industry must be done without too much

emphasis upon practical results. The by-products of research of this nature usually pay ample dividends in practical developments, and the solution of the base project provides at least partial answers to a multitude of smaller related problems and creates basic technological progress which, in the ultimate analysis, determines the status of an industry.

Even though large companies can support research projects of the long-range type managements usually are unwilling to wait several years for the appearance of practical results. Many important investigations almost ready to blossom into a new and revolutionary industrial process have been nipped in the bud by insistence of big business upon a short-time practical expedient to the real answer.

The solution to the time and expense involved in conducting basic research lies in government appropriations, collective or individual industrial grants, liberal scholarships and endowments or an effective combination of all. A pooling of resources should be particularly appealing to small foundries who, although they could not sponsor their own research program, could share together in a common undertaking. Such an arrangement has been established by the Steel Founders' Society of America, and the value of the undertaking is unquestionable.

Outlines Scientific Research Program

An attempt has been made to establish by Congressional action a National Research Council for the purpose of promoting, arranging, and guiding basic industrial, medical, and general scientific research. Dr. Vannevar Bush has published a report to the President entitled "Science the Endless Frontier," in which he has outlined, with the aid of various committees, a program and a justification for postwar scientific research. This book should be read by all persons interested in advancing their industry and concerned with the welfare of their country. In the words of the late President Roosevelt, introducing Dr. Bush's report, "New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life."

Whatever the outcome of legislation on the proposal for a Council for National Research it will behoove the gray iron foundry industry to co-operate in every way possible with one another and with their government to the end that the "fox-holes of industry," as Donald Nelson described the foundries of America, may become the "foxes of industry," something quite different from what they are at present. In order to get their fair share of attention the Gray Iron Found-

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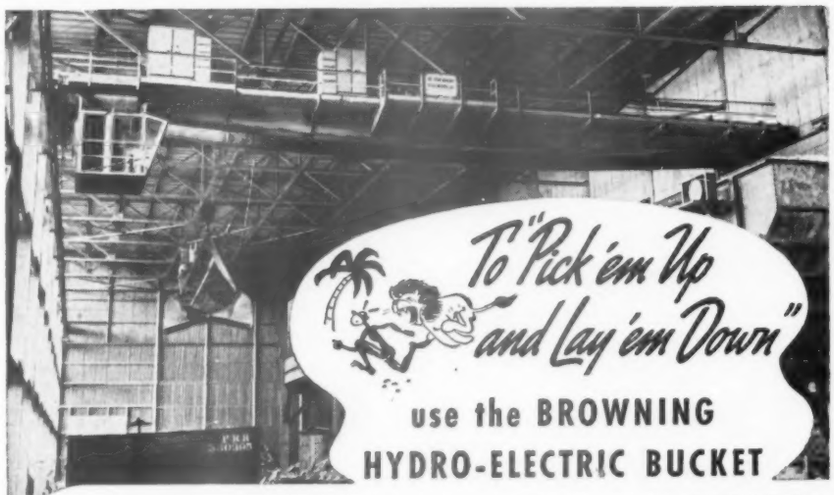

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er's Society will have to be endowed with the necessary funds and powers to formulate and prosecute a realistic and forward-looking research program and to keep a check on all possible avenues whereby this research might be done.

Just as after World War I the Navy became interested in steel castings, so now are they becoming interested in gray iron. The Naval Research Laboratory initiated its research program on steel castings with a directive "to study the fundamental defects of steel castings." The laboratory has done 17 years of research on the subject with a total expenditure of at least a million dollars and it now has a similar broad directive issued by the Navy Department on iron. I cannot predict the same attention to iron that has been given steel, as economic and strategic military expedients may interfere, but at least the groundwork for a healthy program is laid. The technical committee of the Gray Iron Founder's Society has met with personnel of the Naval Research Laboratory on three occasions and has been extremely helpful in developing a basic research program.

Appears Like Favoritism

Many iron foundrymen have felt that the Navy has been partial to the steel industry and that it has failed to recognize the merits of gray iron castings. This apparent favoritism is, of course, partly the result of the Navy in general being better informed about the properties of steel castings than iron and partly because steel has greater strength and ductility with which to withstand ballistic shock and impact. However, it must be admitted that a more judicious balance between iron and steel castings would have been in order for shore establishments and other uses where ballistic considerations were unimportant. Whatever the extent of truth of such allegations the Navy Department's present directive on iron is designed not only to improve the product but also to establish facts upon which designers can base their requirements for the next war, since the Navy's axiom is "In time of peace prepare for war." Even a peacetime Navy with nothing to fight requires castings, so it is not necessary to speculate on the possibilities of future war to justify an interest in gray iron castings.

Although it is impossible to predict any specific direction in which basic research should be done, some of the problems which face the gray iron industry may be worth mentioning.

Gray iron castings are characterized more by the absence than by the presence of risers, while in steel castings the opposite is true. It has often been said that castings made with risers of a size and shape used for steel have showed unsoundness, while castings made without risers have been "perfectly sound." Oddly enough, the observation has some essence of correctness, the chief issue being only with the interpretation of soundness. The casting made with risers was obviously unsound—the one made without risers was apparently sound, not perfectly sound. Risers found suitable for steel are not adequate for gray iron and serve only to localize shrinkage beneath them where it can be readily found.

Omitting risers entirely allows shrinkage to be distributed throughout the casting where it cannot be detected visually because of the insistence of graphite upon filling up all small voids. X-ray studies of slabs cut from castings prove this point. Larger risers are needed for a perfectly fed iron casting than for a similar casting of steel because of the late feed demand of iron.

Of course, there is always the question of need for the perfect casting when a nearly perfect one will do the job. This attitude is prevalent in the gray iron industry and damaging to the future of the industry. It may be somewhat responsible for the term "mere cast iron" which the technical secretary of the society so vigorously attacked some time ago. The best is none too good for castings to be used for strategic applications, and perhaps a little more attention to perfection in all castings is in order. It would not be proper or desirable at this time to recommend risers for all gray iron castings, but it is certain that a scientific research job is needed in order to straighten out some of the anomalies that exist at present in their solidification.

Develop Stress Relieving System

Stresses are as perplexing and serious in iron castings as in steel, and it is certain that stress relieving cycles will have to be accurately determined. The aging of castings for months or years in order to insure stability of dimensions is too slow a process, and present heat treating cycles are not adequate. Research can and will establish the necessary data to enable complete and dependable stabilization of even large castings in a matter of hours.

X-ray, magnetic powder and any and all casting inspection tools should be encouraged for use in the acceptance of iron castings for critical service, and the iron foundryman should be a champion of the cause. Only by guaranteeing his casting and by being ready to subject his product to all methods of inspection can he command the confidence and favor of design engineers. Careful investigation will be required in order to work out techniques and acceptance and production standards, but the age of specializa-

tion will surely demand it.

The effect of melting conditions upon the quality of the metal is a fruitful field of research. For example, most cupola men will swear that quality iron cannot be made in induction furnaces. This same feeling pervaded the steel casting industry at one time, but such fears have been proved to be groundless. It is safe to predict that when proper techniques are developed iron melting in induction furnaces will be commonplace and iron of a quality perhaps not even possible in the cupola will be regularly produced.

Graphitization, chill characteristics, segregation, and control of microstructure have all been studied by competent metallurgists, but much more remains to be done. The principles and control of inoculation and determination of the mechanism involved will bear enlightenment and is a most inviting field of research.

Heat treatment of irons not only to determine stress relief cycles but to improve microstructure may give desirable results.

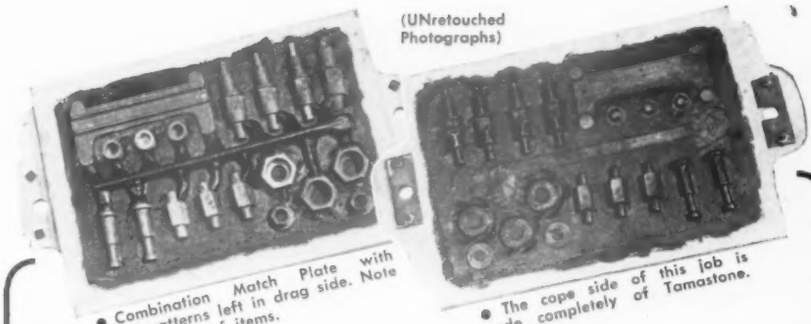
Should Study Natural Sand

Sand practices in most gray iron foundries are obsolete. Added to what is already known about steel sands a relatively small amount of research would provide valuable results. Improved control over and knowledge of naturally bonded sands is greatly needed. Research attention has been directed chiefly toward synthetically-bonded sands in recent years for use in making steel castings, because control over the base ingredients is easier. It has been found that washed and graded silica sand can be used for making castings of all metals, and perhaps the future will see a trend in that direction. Intensified research on the naturally bonded sands may lead to their improvement, or a blending of natural and synthetic foundry sands may prove desirable. Summed up in a sentence, it can be said that sand research is badly needed by gray iron foundries if quality castings are to be produced as economically and in the quantities which will be required.

This is only a start on a long list of practical research problems in gray iron foundry practice, and no attempt has been made to predict what revolutionary changes might be wrought by truly basic research. Suffice it to say that no industry can exist and advance without recourse to science, and the enthusiasm and realistic vigor with which this challenge is met by foundrymen will determine the status of gray iron as a progressive basic industry of the future.

The opinions expressed in this article are those of the author and do not necessarily reflect those of the Navy Department.

(UNretouched Photographs)



• Combination Match Plate with metal patterns left in drag side. Note wide variety of items.

• The cope side of this job is made completely of Tamastone.

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COST CONTROLS NEED READJUSTMENT

(*Concluded from page* 103)

for them.

Wage Incentive Plan: A prerequisite of a good wage incentive plan is a sound occupational evaluation plan, which must be a part of building a sound wage structure or policy. With a good basic wage structure, wage incentive plans can be developed wherein the earnings bear a relationship to the base wage.

Furthermore, no occupational evaluation plan is complete without a merit rating plan, for both the job and the individual must be rated. This plan must be one which bases values on facts and not on personal opinion.

A good wage incentive plan should develop standard data which provides a value, expressed in time, for each element of operation in a job. The time allowance for doing a job is the sum of its element values, and is known as the standard for the job. Whenever an element of operation is added to, or taken away from a job, the standard is increased or decreased by the amount of the element value. Since time is a stable measure, it enables one at any time to evaluate material, method or process changes and to translate these changes into costs.

Plan Difficult to Install

In the words of Phil Carroll Jr., "A sound wage incentive plan is not an easy thing to install. It takes a great deal of time and good management coupled with good engineering to make a completely satisfactory installation. But installation is comparatively easy as compared with the effort required to correctly maintain the plan."

Next, there is the question, "Who is qualified to install wage incentive systems in foundries?" To this, the writer would answer that an engineer must have more than just a knowledge of time-study technique. He should also have intimate knowledge of foundry practices, how practically every operation is influenced or affected by previous operations, and an appreciation of the variables which occur *only* in foundries. Variables which influence time, and which should be taken into consideration when Standard Data is developed, are as follows:

a. Condition of core box equipment.
b. Condition of pattern equipment.
c. Condition of flask equipment.
d. Rate of pouring.
e. Metal temperature.
f. Initial cleaning operations.
g. Workmanship on all preceding operations.
h. Mechanical equipment condition.
i. Materials.
j. Quality requirements.
k. Equipment service.
l. Services by indirect workers.
m. Services by supervision.

Variables such as those listed above should not be compensated for through loose standards but should be allowed for through plus standards or expense allowances.

Unless the engineer on the job has a thorough understanding of the variables which occur in the foundry, he will find it an impossibility to work out standard data which relates earnings and production to a basic wage structure.

Furthermore, there is no one plan which can be applied to all foundries. It is necessary to tailor the plan to fit the particular unit in which it is to be used.

Wages Constitute Major Problem

Although V-J Day is past, the need for greater production is not over, but we are compelled to stop and survey our war-wrecked foundry wage structure. Wages always have been, and always will be, the major problem in industrial relations. Management rushed into wartime wage incentive plans as a relief to production problems. Will they now rush into occupational or job evaluation plans as a relief from their present wage problems? Wages must be brought back into relationship to some basic principles.

It is not a healthy condition for the industry to continue on a path of narrowing the wage differential between the highly skilled and unskilled workers in the industry, as this is in a sense removing the incentive for men to improve their positions by increased knowledge of their skills. Would a rate structure of this kind make the foundry industry attractive vocationally to our youth?

Even the supervisory rate structure has been affected. In this period we have seen the incentive earnings of those in the low labor grades exceed the earnings of their supervisors. How can industry attract men of supervisory caliber when this situation exists? With the installation of incentives for the worker, it is only logical to work out a plan for the supervisor which will enable him to enjoy similar increased earnings.

The foundry industry is still enjoying a seller's market. For how long, no one knows. Under these conditions, to some, it may seem unimportant to give the wage structure serious thought. Such thinking is approval of a wage payment plan based on "ability to pay." There are those in industry who do think this way and perhaps the best example of this is a conversation the writer had recently, with a foundryman. The foundryman told with pride that he was paying a molder an average of about $40 per day. In subsequent conversation it was discovered that the price for the job was a "guesstimated" piece price and although high, it still permitted the foundry to show a profit; therefore in the foundryman's estimation he was justified in paying the worker his high daily earnings. A continuation of such a practice would soon disrupt any wage payment plan in existence.

With ever-increasing wage rates for the industry, it becomes more and more imperative that a true measure of work be obtained for each dollar of wages paid. Moreover, a means of decreasing the man-hours per unit of production must be found if the foundry is to stay abreast of the times and meet competition of other structural materials.

The industry must return to a conservative and intelligent plan for its foundry wage structure; one that compensates the worker on the basis of occupational evaluation and, in the case of incentive plans, standards which produce earnings that bear a relationship to a base rate structure.

With the war's end, plans were made for rehabilitation, replacement and readjustment of returning veterans. With the outstanding work and the results which have now been accomplished for these veterans, as an example, let us now make provisions for *cost controls'* return from war, because it too is a war veteran.

SOME NOTES ON GRAPHITIZATION

(*Concluded from page* 101)

than mere undercooling. (NOTE: References in this paper to 1400 F are approximate. This temperature will vary some with different irons.)

3. Consider the case of some white irons very responsive to a low temperature pre-anneal heat treatment for setting up nuclei and thus accelerating graphitization in the anneal or malleabilizing operation. In cooling in the mold, if part of the casting cooling faster than the bulk of the metal should cool to just below 1400 F and then a heat balance be set up so that this part would be reheated to just above 1400 F, the condition for setting up nuclei by the low temperature treatment would be destroyed and subsequent graphitization

retarded in this part.

4. Still considering the same type of iron, assuming normal cooling in any sand mold down to 800 F the time in cooling from 800 to 400 F should have a marked effect on its subsequent graphitization rate. Frequently castings are shaken out of molds before cooling through this range, but it nevertheless is a range of temperature affecting subsequent graphitization.

Finally, the writer feels that the cooling of the casting in the mold is a heat treatment of prime importance that has not been appreciated, if at all realized, and about which virtually nothing is known. Further, that is a promising field for research deserving of much study.

OBITUARY

S. C. VESSY, president of the W. W. Sly Mfg. Co., Cleveland, died Feb. 14 in that city. An attorney by training, Mr. Vessy represented various indus-

S. C. VESSY

trial organizations, including the W. W. Sly Mfg. Co., prior to his selection as president of that company in 1920. For many years Mr. Vessy was active in associations of the foundry industry, serving as a director of the American Foundrymen's Association and as president in 1933-34 of the Foundry Equipment Manufacturers' Association.

* * *

J. W. McLean died Mar. 7 in Philadelphia. Mr. McLean was associated with Simonds Saw & Steel Co., Fitchburg, Mass., for 44 years, and at the time of his retirement late last year, had been president of Abrasive Co., Philadelphia, a division of that company, for 16 years.

* * *

James D. McGann, 65, who retired recently as manager of the industrial engineering and construction department, International Harvester Co., Chicago, died March 6 in that city. Asso-

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ciated with the company 43 years, he had supervised the design and construction of many of International Hervester's plants.

• • •

John L. Jones, 59, sales executive of the National Foundry Sand Co., Detroit, died Feb. 12 at his home in Hillsdale, Mich. Mr. Jones, a graduate of Alma

JOHN L. JONES

and Hillsdale Colleges, was well known in the foundry industry. He was formerly connected with the Great Lakes Foundry Sand Co., Detroit, and the foundry division of the Pontiac Motor Co., Pontiac, Mich. Early in his career he was manager of Lansing Co., Lansing, Mich., and later was connected with Jahns Cylinder Grinding & Foundry Co., Los Angeles.

Ernest F. Stone, associated with Manning, Maxwell & Moore Co., Bridgeport, Conn., for many years, died Feb. 5, after a prolonged illness. Mr. Stone was a former president of the Connecticut Nonferrous Foundrymen's Association and was serving as a member of the executive committee of that organization for the current year.

• • •

John W. Bradley, 75, president and founder of the Bradley Pattern Works, Buffalo, died Feb. 1, at his home in that city. A native of Buffalo, Mr. Bradley learned patternmaking at an early age. In 1895 he established his own company and was active in the business until shortly before his death.

• • •

Huston W. Bartholomew, 61, superintendent of the Cooper-Bessemer Corp. plant at Grove City, Pa., died Jan. 24 after a brief illness. Mr. Bartholomew had been associated with Cooper-Bessemer for 44 years.

• • •

Oscar Goldfein, 48, one of the founders and a partner, Western Metal Co., Chicago, died Feb. 16 in that city after a long illness. He had been associated with the nonferrous metal smelting trade more than 25 years.

• • •

Edward G. Lee, 65, superintendent of the M & H Valve Co., Anniston, Ala., died Feb. 11 in that city. Mr. Lee had been engaged in foundry work there for fifty years.

George A. Fuller, 57, Detroit branch manager of the Federal Foundry Supply Co., and secretary of the Detroit Chapter of the American Foundrymen's Association, died unexpectedly Feb. 26. Mr. Fuller had served the foundry industry in various districts for 30 years, having started as an order clerk for Federal Foundry Supply Co. in 1916. After

GEORGE A. FULLER

several years in that capacity, Mr. Fuller traveled successively in northern Pennsylvania, New York state, Michigan and finally the Detroit area, where he had been branch manager for more than 15 years. He was recently elected secretary of the Detroit Chapter of the AFA after serving as director for one year. Mr. Fuller's territory will be taken over by his son, George A. Fuller Jr.

Industry BRIEFS

THE major manufacturing and administrative buildings of the aluminum cylinder head casting plant operated by the Aluminum Co. of America at Kansas City, Mo., has been leased to the Vendo Co., that city, for five years, through the War Assets Corp. The plant was built in 1910 for the manufacture of cast iron radiation equipment and was remodeled in 1943 for war work. Floor area covers 321,760 sq ft. The Vendo Co. will manufacture bottle vending and coin changing equipment, low pressure cookers and other items. About 2500 persons are expected to be employed.

• • •

Midstate Foundry Co. has started construction of a new gray iron foundry at Charleston, Ill., and expects to be in production on a general line of jobbing castings some time during April. The building, 70 x 160 ft, will cost approximately $30,000. Partners in the new organization are R. E. Kelly, former owner of the Okaw Valley Foundries, Shelbyville, Ill., and more recently purchasing agent for the Shelbyville plant of the Oliver Corp.; C. H. Bence, former plant superintendent of the H. W. Clark Co., Mattoon, Ill., and G. E. Bryant, former chief engineer of the H. W. Clark Co.

• • •

Zoller Casting Co., a new company, plans construction of a gray iron foundry near Bettsville, O. Robert H. Zoller, since 1944 superintendent of melting at the Saginaw Malleable Iron Division, General Motors Corp., Saginaw, Mich., will head the new company as general manager. David Steinpres, formerly general foreman at Saginaw, will be supervisor of melting. Adolph Jacobson will direct the molding and coremaking department, and August Bejcek will be in charge of plant maintenance.

• • •

Douglas Match Plate & Aluminum Casting Co., 1200 East B St., Belleville, Ill., has been incorporated by John and Russell Gansmann and Frank B. Rogers, for the manufacture and sale of aluminum matchplates and castings.

• • •

Rockwell Mfg. Co., Pittsburgh, has acquired the Arcade Mfg. Co., Freeport, Ill., manufacturer of foundry equipment, hardware for the refrigeration industry, and miscellaneous cast iron and wood toys. Present management of the company will continue, with the exception that L. L. Munn, president of Arcade Mfg. Co. for many years, will retire in the near future.

• • •

K. & A. Aluminum Foundry, Springfield, O., has been organized by Don Applegate, purchasing agent for the Steel Products Engineering Co., Springfield, for 27 years, and Frank Krautwater, vice president and general manager of Parker Pattern & Foundry Co., Springfield, for 25 years.

• • •

Wisconsin Supply Corp., Madison, Wis., has been formed, with $100,000 capital, to take over the mill supplies and heavy hardware wholesale division of the Wisconsin Foundry & Machine Co., that city. The latter company will

continue to manufacture and repair road machinery and other heavy equipment. Both companies will continue to operate at 613 East Main St., and the new corporation plans construction of an office-warehouse, to cost $80,000. Officers of the new company are: Gregory M. Buenzli, president; Philip B. Buenzli, vice president and treasurer; and Col. Howard M. Buenzli, secretary.

• • •

The Joliette Steel Ltd., Joliette, Que., Canada, has been acquired by American Brake Shoe Co., New York, and will be operated by the present management, under the direction of the American Manganese Steel Division of the parent company. Joseph B. Terbell has been made president, and J. L. Mullin, vice president.

• • •

West Co. Inc., Philadelphia, has sold its abrasive division to the newly-organized company, West Abrasives Inc., which is associated with General Grinding Wheel Corp., Philadelphia. Production of rubber bonded cutting, grinding and polishing wheels will be continued and sold through General Grinding Wheel Corp.

• • •

Tennessee Foundry & Machine Co., 806 Sixteenth Ave. N., Nashville, Tenn., is building a new foundry to produce steel castings and to handle precision machine production work, assemblies and fabrications. Maclin P. Davis is president and E. B. Bradley, vice president and general manager.

• • •

Modern Foundry & Mfg. Co., Mascoutah, Ill., which has a new foundry building under construction, has been incorporated by A. H. Klemme, vice president, Eagle Foundry Co., Belleville, Ill.; Frank B. Cosbey, Belleville; and William Y. Skelton, Mascoutah.

• • •

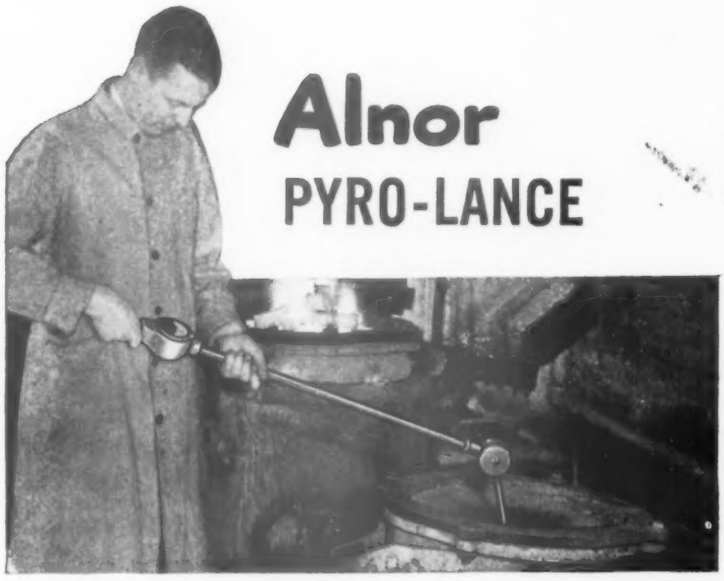
American Gear & Mfg. Co., 6633 West 65th St., Chicago, has let contract to Clearing Industrial District Inc., Chicago, for a one-story machine shop addition, 75 x 150 ft, for its Lindahl Foundry Division, 5900 West Ogden Ave., Cicero, Ill., to cost about $45,000.

• • •

The John F. Groth & Son lime manufacturing plant at Cedarburg, Wis., has been acquired by James R. Vivian, until recently superintendent at Smith Steel Division of Grede Foundries Inc., Milwaukee, from Ernest J. Groth, who has retired.

• • •

Carpenter Brothers Inc., located in the Mayer building, Milwaukee, for the last 26 years, has moved its office and sand-testing laboratory to the Wisconsin Tower building, 606 West Wisconsin Ave., Milwaukee.



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This portable pyrometer is built with a rugged shock-resisting movement and an enclosed extension thermocouple—a unit especially designed for reliable foundry service. It gives you the quick, accurate temperature readings so important to efficient, economical production of sound castings.

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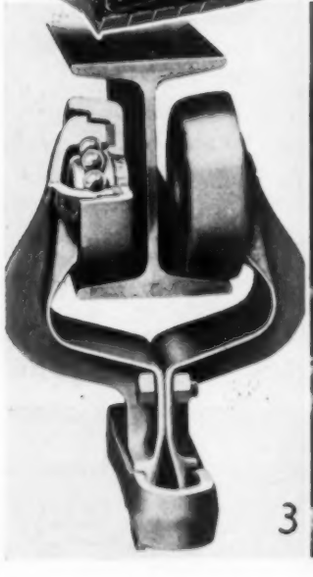
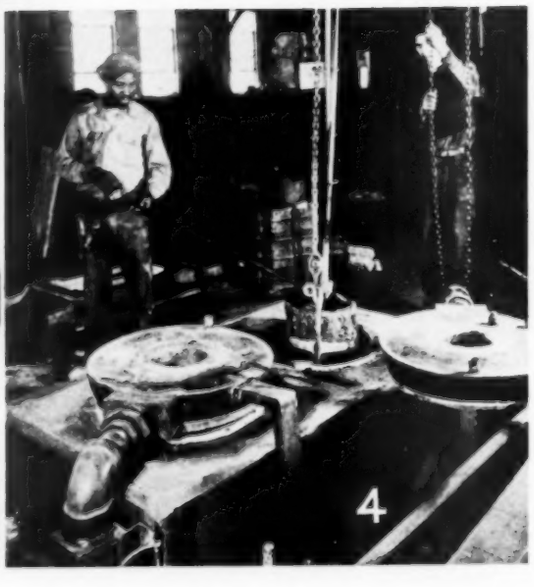
NEW EQUIPMENT and SUPPLIES

(1)—Hand Tractor: Automatic Transportation Co., 121 West 87th St., Chicago 20, announces a new small electric-propelled hand tractor which will push or pull a 6000-lb trailer load all day or up to 20,000 lb intermittently, depending upon plant conditions. It is designed for applications requiring a towing type unit but demanding smaller and more maneuverable equipment than standard electric tractors. Equipped with a bumper plate, and with a coupler available for towing, the unit has a front-wheel drive and finger-tip control. Drive controls are push-button type operated from the guide handle. Two forward and two reverse speeds are controlled by vertical angle of the guide handle, and brakes are applied when the handle is upright.

(2)—Apron Conveyor: Chain Belt Co., 1600 West Bruce St., Milwaukee 4, is introducing a completely self-contained, factory-assembled apron conveyor unit for heavy-duty service. The roller-supported apron feeder is furnished in several widths and with centers ranging from a minimum of 55 in. to a maximum of 109 in. varied by 18-in. increments. At a normal speed of 10 fpm capacities of these units extend up to 80 tons per hour. Longer chain belt life and reduced power consumption are claimed for the design which permits the belt to ride directly on large diameter traction rollers.





(3)—Conveyor Trolley: Link-Belt Co., 307 North Michigan Ave., Chicago, is offering a new free-rolling conveyor trolley which has no wheel shafts, or spindles, and does not require separate retainers for its full complement of hardened alloy steel balls. The wheel and one-piece bracket form the deep inner and outer races of the bearing. The inner race, being part of the wheel forging, revolves within the outer race formed by head of the trolley bracket and distributes wear completely around the ball path. All fixed points of pressure are on the outer race, where the larger diameter provides a greater area of distribution and resistance to wear. The ball-loading hole at the back of the bracket is partially plugged after assembly but provides an open hole for lubrication.

(4)—Melting Furnace: Radiant Combustion Inc., Warren, O., has developed a new top-fired crucible melting furnace for which marked savings in fuel consumption and in life of lining, cover, pot and burner are claimed. Fired with gas or oil, the furnace uses two crucibles in tandem. While one crucible is being heated, all of the flue gases produced are carried by a connecting flue to the second chamber to preheat the second crucible. During pouring, a third crucible replaces the removed crucible to receive cold metal. Covers are cam lifted and swung backward independent of one another. Other reported advantages are: faster heating; lower metal loss through absence of flame impingement on the metal; top location of burners prevents their plugging; metal is always visible and temperatures can be taken without shutting off burners; no burner ports impede replacement of the lining.

Electrodes: Metal & Thermit Corp., 120 Broadway, New York 5, is offering a new line of aluminum bronze and phosphor bronze electrodes varying in chemical analyses and in mechanical properties from high tensile strength and ductility with comparatively low hardness, to medium strength with zero ductility and relatively high hardness. The aluminum bronze electrodes, of types averaging from 120 to 300 Brinell hardness of deposit, are recommended for arc welding of manganese bronze castings and brass sheets, repair of fab-

rication overlays on bearing surfaces subject to shock or impact, building up bushings, bearings and slides operating against hardened steel. The phosphor bronze electrodes, hardness of deposit, 71, produce welds with tensile strengths of 30,000 psi or more, and are recommended for high-speed welding of bronzes, brasses, copper, steel and both cast and malleable iron.

Screening Feeder: Syntron Co., 540 Lexington, Homer City, Pa., announces a new line of large capacity, heavy duty vibratory screening-grizzly

feeders. They are designed with the pulsating magnet located forward and above the grizzly deck, so that the full length of the grizzly is utilized for material separation and discharge. Actual conveying or feeding is restricted to oversize material, the bulk of the fines being vibrated through at the rear of the trough upon introduction to the feeder. The model shown has an actual conveying capacity of 200 tons per hour, but for separation purposes this capacity must, of necessity, be cut down to meet the percentage of fines discharge required by the user. Feed control is regulated by rheostat but can be arranged for automatic control. Maintenance and operating costs are said to be low on installed equipment.

Core Binder: Resinous Products & Chemical Co., 222 West Washington Square, Philadelphia has developed a synthetic binder of urea-formaldehyde resin that is said to improve the core sand used in casting such metals as aluminum and magnesium. A dust-free, water dispersible powder, it may be added directly to muller, kneader or paddle-type mixers. Core sands mixed with this binder may be stored prior to baking as long as 4 to 5 hours without reported loss in tensile strength. Curing is by condensation rather than oxidation, and baking is completed in relatively short time and at comparatively low temperature.

Welding Outfit: Patent Specialties Inc., 4020 Tenth Ave., New York 34, announces a complete portable welding outfit installed in a convenient carrying case, which operates on 110-v, 60-cycle ac, for arc welding, brazing and contact soldering. A complete kit of welding supplies including helmet, brazing rods and flux, aluminum rods and flux, coated steel rods, acid core sticks, carbon electrodes and instruction book, are included with the outfit.

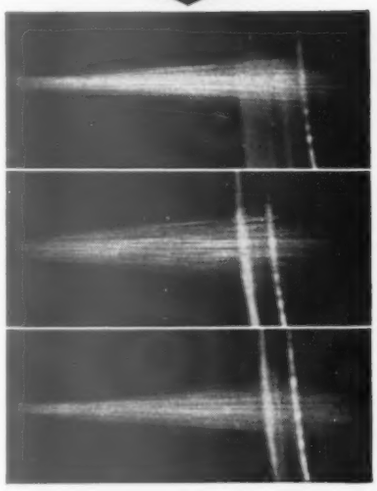
Reactor Control: Westinghouse Electric Corp., Pittsburgh, has developed a new control system for overhead cranes by which a wide speed variation at different loads and improved lowering characteristics are possible with induction motors. This is accomplished by unbalancing the voltages of a polyphase system. By use of the reactor in one primary line, the voltages applied to the terminals of a three-phase wound-rotor motor are deliberately unbalanced, causing the motor to operate at increased slip for reduced hoisting, and for better controlled lowering speeds. By the use of a saturable core reactor the amount of induction inserted can be varied to a wide extent.

Dust Collector: Standard Electrical Tool Co., 2507 River Rd., Cincinnati, O., has added a new belted, motor-driven dust collector to its line of products. Designed primarily for 25-cycle current, it also is available for 60 cycles. The unit is produced in two sizes, one 500 cfm, 19 x 24 x 52 in. driven by ¾-hp motor; the other 1000 cfm and driven by a 1½-hp motor is 23 x 24 x 59 in. Designed for collecting dust from all types of grinding, buffing and polishing wheels, the lower compartment contains the suction fan with motor, while the ample size collecting chamber is on the top.

Fork Truck: Clark Tructractor Division, Battle Creek, Mich., has de-

signed a compact, light-weight fork truck for lifting, carrying, stacking and tiering unit package loads weighing up to 1000 lb, and for operating within narrow limits. The truck is adapted for fast, low cost loading and unloading of highway trucks and trailers and for

Photographs don't lie..



THESE *Prove* VALUE OF AMERICAN NOZZLES

The top picture is a high speed photograph of the blast stream from a new iron nozzle—note that stream concentration, abrasive velocity and volume are fair.

The middle picture shows the same nozzle after three hours' use with silica sand. Outlet opening has worn to twice the original size, stream concentration is poor, abrasive velocity and volume are low.

The bottom picture shows the stream from an American-Norbide Nozzle after 404 hours use with sand. Outlet diameter is worn only 0.032" and stream concentration, abrasive velocity and volume are high. Hundreds of hours of useful life remain in this nozzle.

This is but one specific illustration of the long-wearing, efficient blasting qualities of American Air Blast Nozzles . . . an important illustration, too, when you consider how compressed air costs jump as nozzle wear increases. The American-Norbide Nozzle, together with its companion nozzles, American Heanium and American-V-Metal, afford a complete range of selection as to price and type to meet your blasting requirements.

Write today for the new American Nozzle Catalog—learn first hand the full details about these long-wearing nozzles.

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Purite • Goulac • Glutrin
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Truline Binder

The Smith Facing & Supply Co.
1857 Carter Rd., Cleveland, Ohio

maneuvering in narrow aisles. It has an exceptionally small turning radius of 57 in.

Air Hoist: Keller Tool Co., 4601 Lake St., Grand Haven, Mich., has developed a portable air hoist that can

be set up quickly for heavy lifting but is light enough for easy handling. The new unit weighs only 30 lb. Speed varies from 17 fpm full load to 30 fpm no load. One motion of the control bar, held by operator, opens a nonleaking poppet type throttle valve, slides a reversing valve into desired position, releases the brake, and raises or lowers the load. Brake is fully enclosed and easily adjusted, and is fully mechanical, not dependent on air supply for its operations. Dimensions: hook to hook, 13¾ in.; wall clearance, 5 in.; overall length, 14½ in. The hoist is available in 500 and 1000 lb capacities.

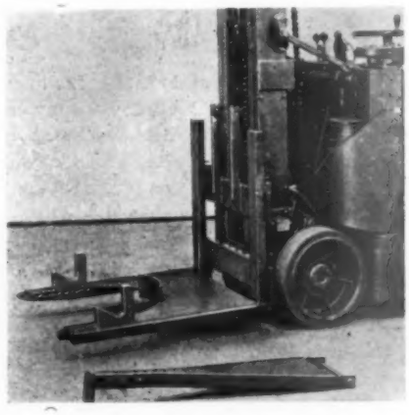
Light Reflector: A light reflector of new design and new principle of light reflector for use in flashlights, searchlight reflection for use in flashlights, searchlights, lanterns, spotlights and floodlights is announced by the General Detroit Corp., 2270 East Jefferson Ave., Detroit 7, Mich., and the General Pacific Corp., 1800 South Hooper St., Los Angeles 21, Calif. Instead of a smooth wall finish which causes light beams to clash with one another, the new reflector has a surface broken into multiple diamond shapes to reflect all the light.

Lifting Device: Boyer-Campbell Co., Safety Division, 6540 Antoine St., Detroit 2, Mich., has developed a device known as the Granny Grip, a cam lever mechanism and chain that grips, lifts and holds heavily laden barrels, steel plates, etc. The standard unit includes two stamped alloy steel bodies, the cam lever mechanism, and alloy steel chain capable of lifting any load that can be engaged by the jaws. Tensile tests have shown a capacity up to 4 tons. The grip is particularly designed to facilitate handling of material with industrial trucks and cranes. It may be installed in a few seconds and released just as quickly.

Rust Remover: Nox-Rust Chemical Corp., Chicago 8, has perfected a rust remover for castings, steel stock, hand tools and fabricated parts that can be applied by brush, spray or dip. The new chemical wets the metal thoroughly, dissolves rust scale rapidly, removes it completely and is non-corrosive to steel even under conditions of long exposure. The liquid is available in pint to tankcar quantities.

Roller Bearing: Bantam Bearings Division of the Torrington Co., South Bend 21, Ind., announces a self-aligning spherical roller bearing which is adaptable to heavy-duty performance in a wide range of equipment. In addition to the self-aligning feature, the new bearing offers two-directional thrust, high radial capacity, high thrust capacity and unit construction for easy installation. It is available in a full range of sizes from 1.5748 in. bore, upward.

Metal Handling: Elwell-Parker Electric Co., 4220 St. Clair Ave., Cleveland 14, announces a fork truck attachment to expedite handling of molten metal ladles in foundries. The attachment is in the form of an apron which slips over the tines of the fork and is held in place with two bolts. Outer edge of the apron is cut away in semicircular shape, according to circumference of the ladles. Brackets are welded to upper edge of the apron in alignment to conform with arms on the

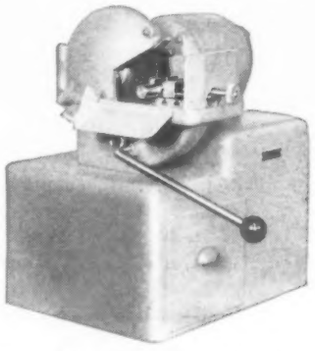


ladle. The ladle filled with molten metal is picked up and transported to molds, conserving heat and expediting the casting operation. This particular fork is of the notched type which facilitates handling also of cast wheels in wheel foundries.

Commercial Lamp: Westinghouse Lamp Division, Bloomfield, N. J., has developed a 100-watt mercury vapor

lamp which produces three times the light of an incandescent lamp of the same wattage. The lamp, which was designed for the lighting of high-ceiling factories, measures 14 in. long and is less than four in. in diameter. The arc is encased within an inner quartz tube. When electricity passes into the lamp the mercury vaporizes and a flaming arc forms between the two electrodes, located on each end of the tube.

Abrasive Cutter: Buehler Ltd., 165 Wacker Drive, Chicago 1,



has designed a new 1 hp abrasive cut-off machine for metallurgical laboratories and for general industrial use where precision and accuracy are required in abrasive cutting. The cutter is a table mounted model, occupying small space and capable of cutting metal samples up to 1 in. stock. Coolant is supplied by a recirculating tank which is placed on the floor with hose connections to cutter.

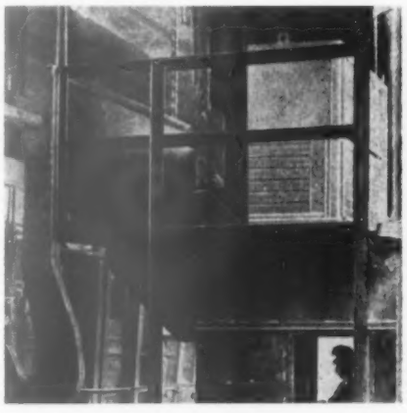
Face Shields: Standard Safety Equipment Co., 232 West Ontario St., Chicago 10, has designed a new line of face shields, streamlined for speedy front replacement. Phosphor bronze spring retaining clips lock the visor firmly into position. Visors are replaced by lifting the retaining clip and sliding new front into place. The new shields of light weight and sturdy construction, furnish protection to the face and eyes from flying particles, sparks and splash of acid and molten metal. They are available in both open top and covered crown styles.

Pattern Finish: Bray Corp., Pasadena, Calif., has developed a wood pattern protective finish of synthetic rubber which gives patterns a hard, smooth surface. Known as Vulcabond, it fills pores of the wood completely and prevents sand from adhering to the pattern. The coating is said to be impervious to water, oil and other materials used in preparation of molding sand; dries quickly, and can be applied with brush, spray or by dipping.

Flow Meter: The Hays Corp., Michigan City, Ind., announces a new indicating flow meter for measuring, indicating and totalizing various liquids. Rate of flow at a point remote from where the meter is installed may be secured by mounting the generator on top of the flow meter, the same shaft operating both the generator and totalizing register. No external source of electricity is required as indicating meter measures output of the generator and is calibrated to indicate corresponding rate of liquid flow through meter. The scale of indicator can be calibrated to read in any values of flow desired. The meter is recommended for measuring flow of oil, water in chemicals, fuel oil to oil-burning furnaces and boilers, heating or cooling liquids and the blending of two or more liquids.

Interval Timer: R. W. Cramer Co. Inc., Centerbrook, Conn., has developed a new electric interval timer to control running time of process equipment, duration of exposure, to close one circuit and open another at a predetermined interval or to operate signal after a certain time interval. The new timer has larger dials designed for easy reading and setting, sturdy frame construction, and simplified screw mountings designed to conform to standard instrument practice so that timers may be grouped on instrument panels in combination with other instruments.

Crane Cab Cooler: Dravo Corp., Machinery Division, 300 Penn Ave., Pittsburgh 22, has developed a



new air-cooled conditioning unit for cabs of overhead cranes. The unit, which is fitted to the top of the cab, is electrically operated. All equipment is enclosed in a steel frame and housing. Air supplied to the cab is cooled, cleaned and constantly circulated. Maintenance consists of occasional changing of filters. The unit withstands vibration.

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If you need an oven for drying plaster molds—investigate Lanly "engineered" units that meet all demands for economy, safety and automatic operation.

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Lanly is an organization of specialists experienced in solving drying, baking and processing problems of various kinds. Consult them without expense or obligation when the need arises.

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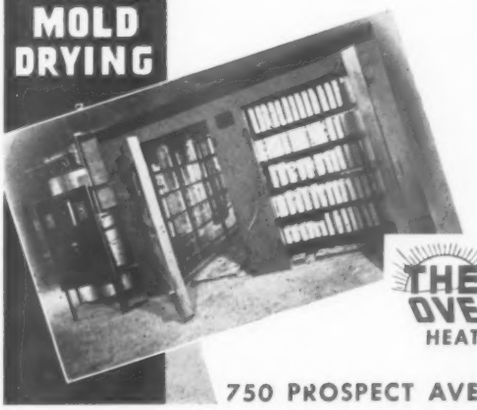

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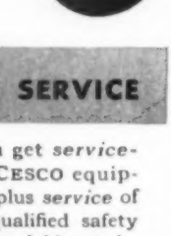

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CESCO FOR SAFETY

MAKING CAST IRON INGOT MOLDS

(*Continued from page* 86)

diameter steel rods are laid against the arbor from top to bottom before any sand is rammed in the mold. The number and position of the rods depends on the shape and size of the ingot mold. Usually they are placed about 4 in. apart after placing one definitely in each corner of square or rectangular molds. At the shoulder of the arbor, near the top, the rods are removed. Wax vents inserted in the openings are drawn together to terminate in the short length of steel pipe. Concentrated in this manner, the jet of flame issuing from the pipe when the core is surrounded with molten iron indicates what a surprising volume of gas is generated from such an apparently inert material as molding sand in which the only combustible material is the carbon and binder in the blacking.

After the mold has been rammed, it is taken apart to permit application of a coating of blacking to the face of the mold and core. The combined mold and core them are loaded on a car. Iron blocks 4 in. high separate the mold, usually referred to as the "jacket," from the base plate and promote circulation of the hot oven atmosphere inside the mold. This procedure also differs to some extent for that practiced elsewhere. In some instances the separated molds and cores are loaded on a car. In other instances the cores are suspended by the necks in ovens partly or altogether below the floor level. In either of these instances the cores are not attached to the base plates.

Mold and Core Dried in Oven

The molds are not placed in an oven. Each mold is placed upright on an iron plate with a round hole in the center, and rests on the wall of a small firing chamber. A coke fire or a gas flame quickly dries the face of the mold to the required depth. Even where the sand is not dried all the way back to the flask wall, the skin drying is sufficient, since—except in an emergency—the molds are assembled and filled with metal immediately after they are dried and before any dampness from the backing sand has time to seep toward the face.

In the Bethlehem ingot mold foundry the molds and cores, as outlined in a previous paragraph, are loaded on cars and drawn into a battery of eight ovens measuring 12 x 25 ft and arranged in a straight row between the molding floor and the pouring floor. The ovens are fired with coke oven gas, with burners, flues, dampers and circulation features designed to evaporate the moisture and dry the molds and cores in a period of 5 or 6 hours. By the time one carload is dried, a second car is loaded and ready to be drawn into the oven. The tracks in each oven extend a considerable distance beyond the door at each end of the oven. Loaded cars enter at one end and are drawn out through the other end. After they are unloaded they are returned to their former position between the molding floor and the ovens.

Molds are taken from the cars and set up on the floor in long lines close to and paralleling on both sides a steel frame, concrete-floored platform 7 ft wide and 175 ft long. The molds are assembled on the foundry floor with the tops approximately flush with the floor of the platform. Each jacket is lifted a few inches by the crane while an attendant removes the iron blocks between jacket and base plate. The jacket then is lowered into contact and clamped in place. A green sand pouring basin is constructed around the upper end of the sprue, partly to break the fall of the metal, and partly to form a pool in which any loose and floating foreign material might remain on top instead of going down the sprue and entering the mold through the single gate at the bottom. The pouring basin is kept full until the metal in the mold reaches a short distance from the top of the open mold. Pouring then ceases. Metal in the basin sinks into the sprue and leaves the basin empty, while the metal in the mold rises to the desired level.

Employ Bottom Pour Ladle

Metal is poured into the pouring basin of each mold through a nozzle in the bottom of a 20-ton capacity ladle of the same type as that employed for pouring steel ingots in the open-hearth department, and for pouring castings in the steel foundry. The ladle suspended from the crane is moved in succession over the molds and the lever man and attendants walk along the elevated platform. The ladle is refilled as often as necessary from a rolling type mixer with a holding capacity of 450 tons.

Bessemer iron having an approximate analysis of 1.50-1.75 per cent Si, 0.80 per cent Mn, under 0.05 per cent S, under 0.14 per cent P, 4.00 per cent C, is brought from one of the company's blast furnaces in horizontal, cylindrical ladles with a capacity of 150 tons, and mounted on railroad trucks. From a somewhat general resemblance to underwater sea going craft, these brick-lined, insulated ladles are known as *submarines*. Loss of temperature in transit, in the waiting period and in the mixer is negligible. Usually it is necessary to accelerate the

temperature loss in the ladle before the metal is poured into the ingot mold.

The metal is poured at the lowest temperature consistent with safety and good foundry practice to minimize shrinkage, erosion and fusion, and wrinkles or cold shut areas. At times the metal is cooled in the ladle by immersing and dissolving sprues and other forms of scrap. The amount of sprue in an ingot mold foundry, in proportion to the total amount of metal cast, probably is the lowest in the list of all foundry classifications. For example, the weight of a 2-in. diameter sprue 6 ft long is 60 lb, or 1 per cent of the weight of a 6000-lb casting. The same approximate proportion prevails on all sizes. In the extremely large sizes, the proportion is even less because there is no need for a sprue over 3 in. in diameter to take metal from a nozzle 2 to 2½-in. in diameter in the bottom of the ladle.

Jackets Are Stripped

After the metal has solidified, the molds are taken away from their position on either side of the pouring platform and laid down on the shakeout floor, which occupies nearly one-half the space in the center bay of the foundry building. Here the jackets are stripped and the core barrels and base plates are removed and returned to the vicinity of the ramming stations in the side bay of the foundry. In some instances the jacket is of one-piece heavy construction, with horizontal and vertical ribs. In other instances the jacket is in two parts accurately joined by pins and held together by clamps and wedges. The empty flask is assembled while in a horizontal position and then upended before it is lowered onto the base plate. The vertical joint at one side is extended to form a pocket or receptacle for the sprue.

The ears, or in foundry nomenclature the "lugs," at the top of the ingot mold pattern are fitted into dovetail slides and come away with the jacket when that part of the mold is removed from the pattern. When they have cleared the top of the pattern, the operator lifts them out of the mold and replaces them on the pattern. The projecting members on two sides of the casting at the top facilitate handling with the crane while the castings are passing through the cleaning and shipping room. The main purpose, of course, is for attachment of the hooks on the stripper which lifts and removes the ingot mold from the steel ingot each time the mold is in service.

Buttress & McClellan plan construction of a foundry building at Pacific Ave. and 46th St., Vernon, Calif., 75 x 120 ft, to cost $30,000.

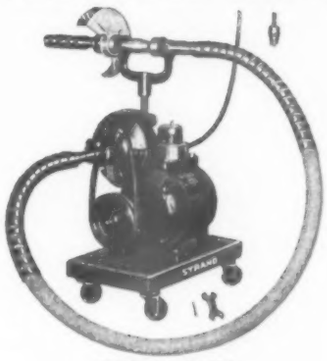
1905 Strand 1946

FLEXIBLE SHAFTS

FLEXIBLE SHAFT MACHINES

ALL TYPES AND SIZES—1/8 TO 3 H.P.

STURDY WELL DESIGNED AND EFFICIENT MACHINES FOR THE FOUNDRY PATTERN SHOP AND MACHINE SHOP



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TYPE MY7

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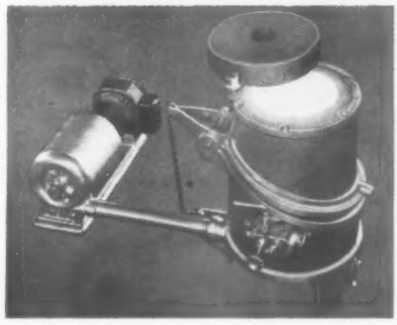

For faster, lower cost non-ferrous operation the Iler Crucible Draw Furnace offers advantages not obtainable in any other type of furnace. The unique, Split-Body Design, an exclusive feature, insures quickest removal and replacement of crucibles. No tongs nor overhead handling equipment is necessary. The special open-side shank permits direct pouring, eliminating over-heating of metal and the cost of extra crucibles, ladles, etc.

An automatic air lift opens and closes the furnace at the touch of a valve, speeding up operations and doing away with heavy lifting. When open, the heat is trapped in the upper section of the furnace, reducing reheating time and effecting substantial savings in fuel. No pit is required; the furnace is mounted on legs and rests on the foundry floor.

The Iler is low in first cost and insures long, economical service. Available in sizes 50 - 70 - 90 - 125 to accommodate crucibles of these corresponding numbers. Gas or oil burner optional. Get the facts on the savings Iler can provide in your foundry.

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NEW TRADE PUBLICATIONS . . .

VIBRATING SCREENS: A new 32-page folder issued by Screen Equipment Co. Inc., 9 Lafayette Ave., Buffalo 13, entitled "A Guide to Better Screening," provides illustrations and descriptive matter covering installations for all types of screening jobs. Equalizer assemblies, standard models, units for screening all types of sand and gravel, for use in many branches of metallic and non-metallic mining activity, for screening out tumbler chips, blast furnace cinders, and for sand reconditioning, are among the installations pictured.

X-RAY EQUIPMENT: North American Philips Co. Inc., 100 East 42nd St., New York 17, offers a new 12-page booklet which describes industrial equipment for fluoroscopy, radiography, diffraction and spectrometry. Illustrations and descriptions of units for internal inspection of castings and parts, plastic structures, etc., are included. Radiograph illustrations show applications, and a selector chart is furnished for determining unit best suited for given tasks.

HEAT COST CHART: J. O. Ross Engineering Corp., 350 Madison Ave., New York 17, has available an informational chart stressing the importance of choosing the most suitable source of heat for processing requirements. As an aid in making the proper choice the chart shows the Btu's obtained for one cent from electricity, oil, natural and manufactured gas.

SAFETY EQUIPMENT: Mine Safety Appliances Co., Pittsburgh 8, has published a complete 178-page catalog, 6-B, which describes and illustrates a complete range of safety equipment for industrial application. Introductory section describes complete research laboratories and plant facilities.

MACHINE TOOLS: Catalog No. 14, a new 72-page bulletin offered by the Delta Mfg. Co., 600 East Vienna Ave., Milwaukee 1, contains illustrations and descriptive matter covering a complete line of production machine tools. Dimensions, specifications and price list insert accompanies the catalog.

ENGINEERING SERVICE: Associated Engineers Inc., 230 East Berry St., Fort Wayne 2, Ind., offers an 8-page brochure, Form 33, entitled "Management Engineering Counsel," which describes types of management counsel service rendered to industry. Engineers, architects, accountants, metallurgists and technical advisors, skilled in their fields, are available in matters of direction and control.

POLISHING MACHINES: Bulletin B2, published by the Standard Electrical Tool Co., 2507 River Rd., Cincinnati 4, describes in detail a line of variable speed buffing and polishing machines, available in sizes from 1 to 15 hp. A dial control

CONFERENCE: Executives of Roots-Connersville Blower Corp., Connersville, Ind., attending the recent sales and engineering conference of the parent organization, Dresser Industries Inc., at Mineral Wells, Tex. Left to right: R. H. Owens, manager, centrifugal department; B. C. O'Brien, vice president; Emery Huston, secretary; F. F. Bogardus, sales engineer

instantly reflects any spindle speed change from 1500 to 3000 rpm to permit both buffing and polishing on the same machine at required speed.

ELEVATING TABLE: Lyon-Raymond Corp., 2488 Madison St., Greene, N. Y., has published Bulletin 141, a two-color circular describing a new hydraulically operated elevating table for transferring of work from one level to another, feeding sheets to shear or press, loading or unloading motor trucks, and many other uses. The table loads up to 2000 lb max.

BATTERY CHARGERS: Bulletin 203, published by the Electric Products Co., 1725 Clarkstone Rd., Cleveland 12, is a 20-page handbook of information on battery chargers for materials handling systems. Single and multiple-circuit chargers, two-bearing motor generators for nominal ratings up to 25 kw, four and six-bearing motor generators for nominal ratings above 25 kw, enclosed, dead front switchboards, and details of automatic operation are contained in the bulletin.

CUTTING ELECTRODES: Ellwood Products Corp., Ellwood City, Pa., has issued a new bulletin which gives complete details and specifications as well is instruction for use of electrodes for underwater or surface cutting. The electrodes can be used with any portable welding set by simply adding a tank of oxygen.

FINISHING MATERIALS: Industrial Finishing Division, Department P-1, McAleer Mfg. Co., Rochester, Mich., has just issued an illustrated 24-page reference manual on polishing, buffing and deburring. The booklet describes compositions best suited for finishing all types of metals, non-metals and plastics.

GRINDING: Robertson Mfg. Co., Trenton 5, N. J., has available a catalog of mounted wheels and points which, in addition to presenting the features of these items, contains complete information on critical speeds, operating rules, and standard shapes and sizes. A detachable form which can be used to send information and sketches to the company for recommendations as to size of wheels to be used for a particular problem, is included.

AIR SEPARATOR: Bulletin S-13, a 4-page circular offered by the Swartwout Co., 18511 Euclid Ave., Cleveland 12, describes a combination air separator and trap for users of compressed air tools and operations. Moisture, oil, scale and other solids are whirled outward to the walls of the separator where they drain down to the ample trap section, the dry air passing out to the feed line or tool without pressure drop.

FRICTION MATERIAL: General Metals Powder Co., 130 Elinor Ave., Akron 5, has available a 4-page folder which describes compressed metallic friction facings, available for use immersed in oil as well as for dry operation. Disks may be made in diameters as small as ¾ in., in thicknesses ranging from ⅜ in. or more, down to .015 in. or less.

Centrifugal Casting News

Vol. 5 — CENTRI-MECO of KALAMAZOO — Apr. '46

NEW "DO-ALL" Centri-Meco Casts in either a Vertical or Horizontal position!

Now Centri-Meco engineers offer another outstanding advancement in the production of centrifugal castings. The new Centri-Meco "Do-All", for either horizontal or vertical operation, employs an outboard-bearing unit which eliminates noisy trunions. The "Do-All", shipped recently to the U. S. NAVY, handles up to 10 foot x 18" diameter castings, horizontally as shown, and up to 60" diameter molds stacked 40" above spinning head when installed for vertical operation. Its many features include the exclusive Miracle-Hub, heat-free bearing construction. "Do-All" custom-built machines are available to meet your particular production requirements. Write for Data!

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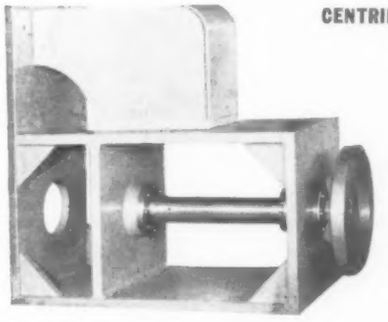
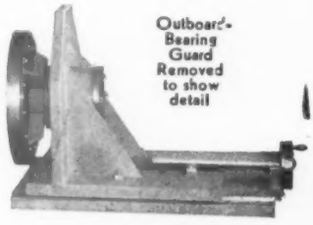
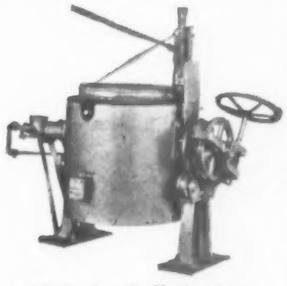




JOHNSTON

BRASS MELTING CRUCIBLE FURNACES



Write for Bulletin F-223

For melting all brasses, bronze, copper, aluminum. Tilting mechanism locks in any position. Simple, handy cover lifting mechanism operated from front of furnace. Heavy 1/4" steel shell. High capacity, rapid melting. Low metal losses. Long crucible life. Low fuel cost with JOHNSTON Reverse Blast Low Pressure Burners—Oil or Gas. ALSO STATIONARY TYPE.

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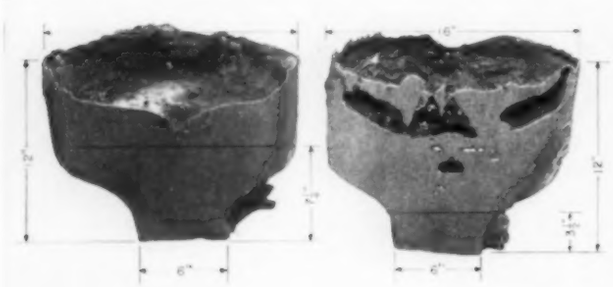
This is accomplished by retarding solidification by thermit action. SOFFEL'S CARBON FREE LIQUIDIZER kicks sluggish metal back to fluidity and life, keeps it that way by its insulating properties, and keeps heads and risers open and fluid. As a deoxidizer, when added in the pouring ladle, it removes occluded gases, increases the tensile strength and transverse, and REMAINS A POWDER, which is easily skimmed off. Free samples furnished in continental United States and Canada.

Beware of imitations! We are the originators of Carbon Free Liquidizers.



RISER ON LEFT CONTAINS TWICE AS MUCH SOUND METAL

These risers, made in the same mold, graphically illustrate how Soffel's Carbon Free Liquidizer produces sounder castings and saves metal. By use of the Carbon Free Liquidizer, the riser on the left has more than twice as much sound metal in feeding head than the conventional riser on the right. In order to produce an equal amount of sound metal by old-fashioned methods, it would be necessary to increase the total weight of the riser head by 215 pounds.

FLUXES AND PURIFIERS FOR ALL METALS AND ALLOYS

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This is the major problem of business today. Rising wage costs—often against stabilized prices—squeeze out profits, unless management finds a way to produce more per dollar of payroll. The answer may be in new procedures or better controls.

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in Flexible Shaft Construction Since the Use of Wirewound Cores. In flexible shafts the wire core wears out first. Exclusive with WYCO Flexible Shafts is this Patented Non-Metallic Innerliner that makes the core last far longer; run more smoothly; transmit more power.

The WYCO Innerliner does . . . Protect piano wire core from frictional contact—Prevent excessive wear—Prevent crystallization of core (prolonging life)—Insure cool and truer running shafts, free from vibration. Standard Equipment with every WYCO Flexible Shaft Machine.

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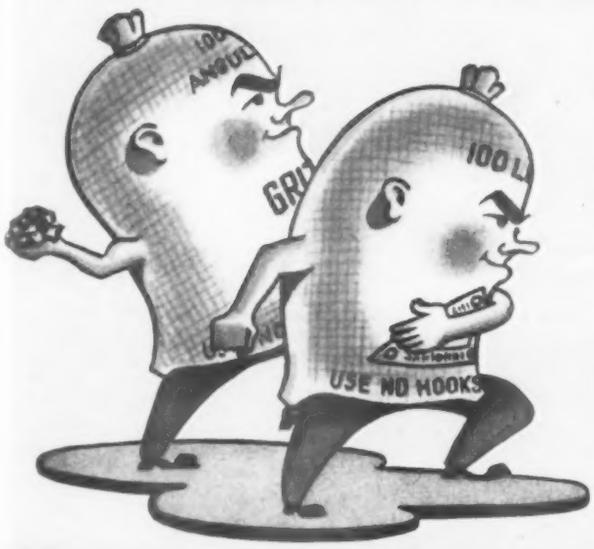

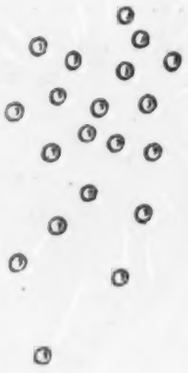

because a returned alloy makes them harder and more durable

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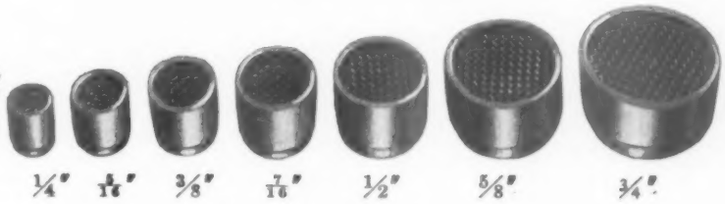

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¼" 5/16" ⅜" 7/16" ½" ⅝" ¾"

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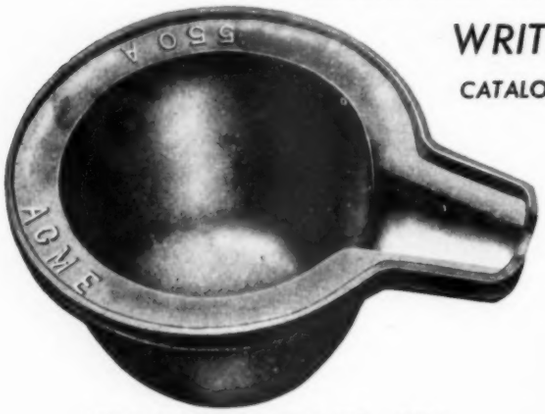
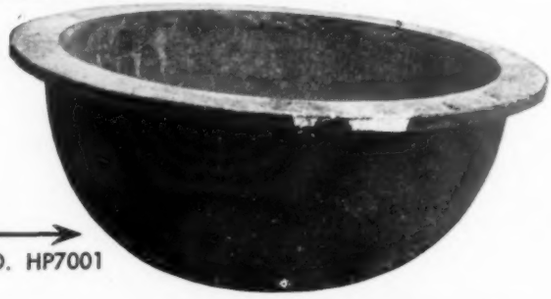
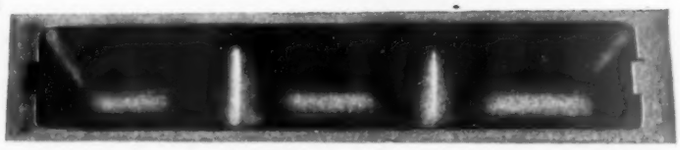


ROUND SPOUT POT NO. 550A
WITH 1½" COLLAR ON FLANGE



HOLDING BOWL NO. HP7001



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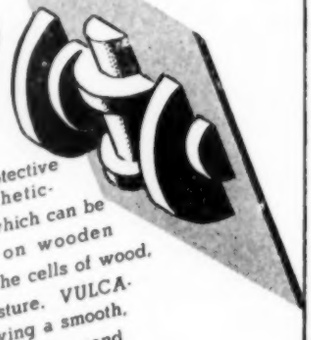
FOR CLEANER CASTINGS AND LONG PATTERN LIFE



VULCABOND protective coating is a synthetic-rubber-base liquid which can be painted or sprayed on wooden patterns. It penetrates the cells of wood, seals them against moisture. VULCABOND dries quickly, leaving a smooth, dense surface that helps to keep sand from adhering to the pattern when it is drawn from the sand. Patterns coated with VULCABOND are not affected by heat, acid, alkalis, steam, oil, gasoline or alcohol. VULCABOND resists wear

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Descriptive Bulletin 453 on Quandt Core Oil and Quandt Core and Mold Wash will be sent upon request.

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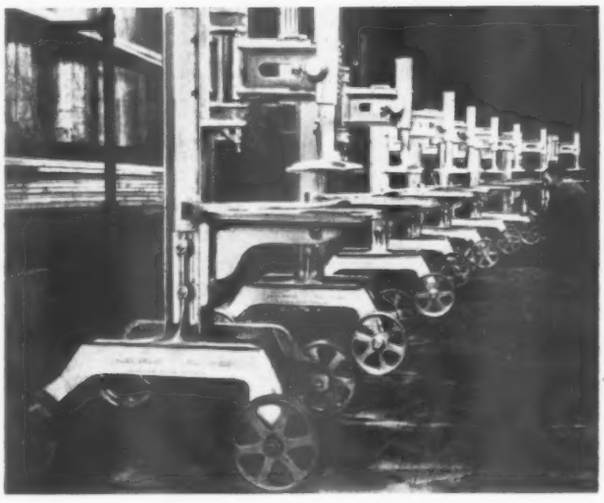
MIW

Another shipment of
MOLINE
SQUEEZERS...



Ready for Business!

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● THE RELEASE OF IMPORTANT ALLOYS NOT OBTAINABLE DURING THE WAR, ENABLES US TO ADD TO THE AMAZING QUALITY OF OUR PRODUCT.

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When molten metals have "come up to heat" temperatures must be checked promptly. There can be no long delays while tips are being renewed in thermocouples.

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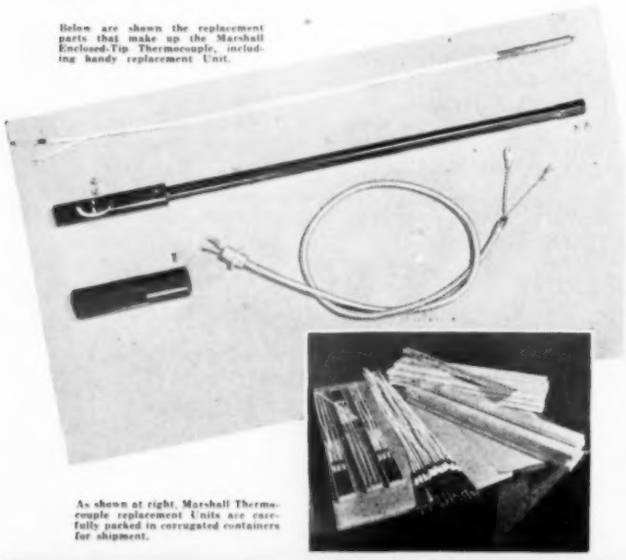
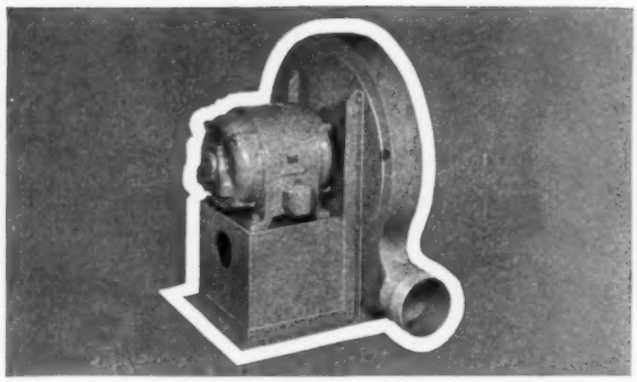
Thus the service from a Marshall Enclosed-Tip Thermocouple can be continuous and uninterrupted. Send for the descriptive Bulletin. L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio.

Below are shown the replacement parts that make up the Marshall Enclosed-Tip Thermocouple, including handy replacement Unit.



As shown at right, Marshall Thermocouple replacement Units are carefully packed in corrugated containers for shipment.

MARSHALL
Thermocouples



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Single- and Multi-Stage
Pressures—4 to 32 oz.
FOR GAS AND OIL BURNING
in Non-Ferrous Melting,
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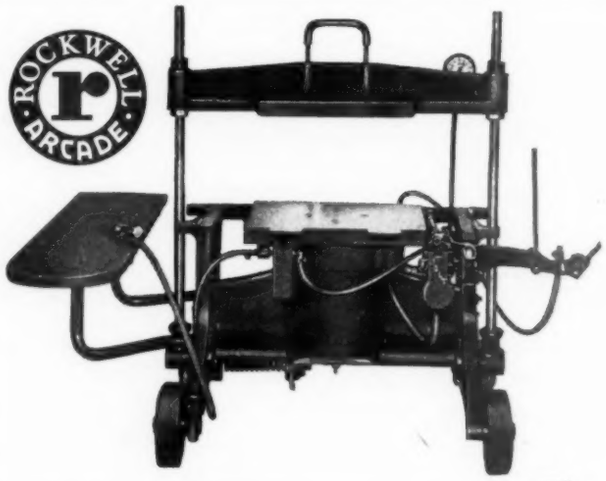

DEPENDABLE
JOLT SQUEEZERS

	No. 91	No. 101
Jolt Cyl.	4"	5"
Squeeze Cyl.	10"	13"
Between Uprights	36"	38"

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Rockwell Manufacturing Company
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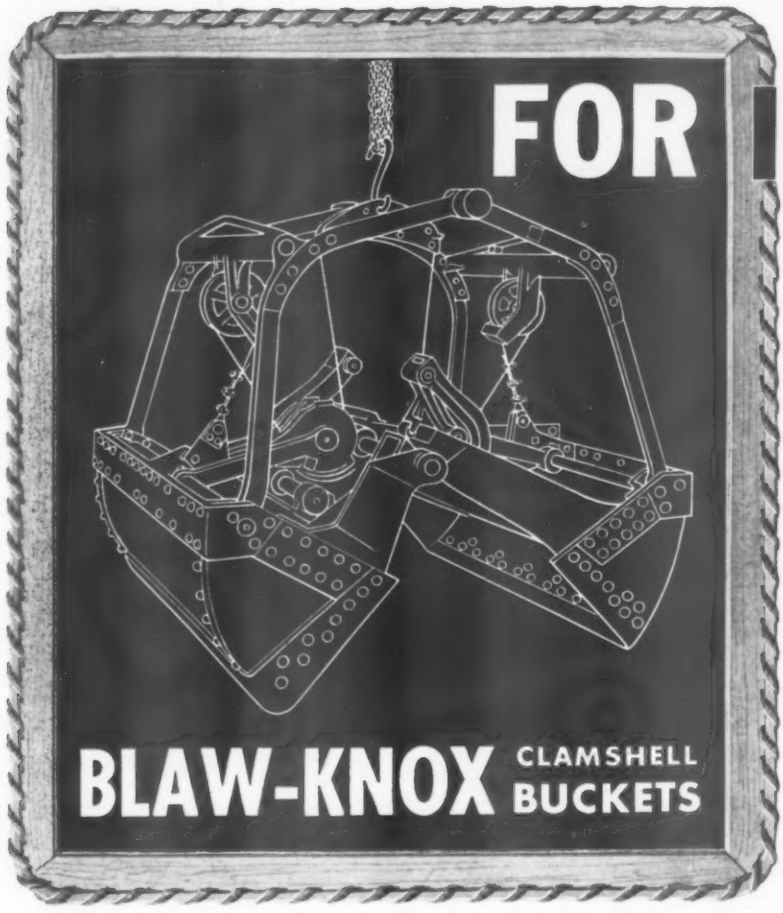

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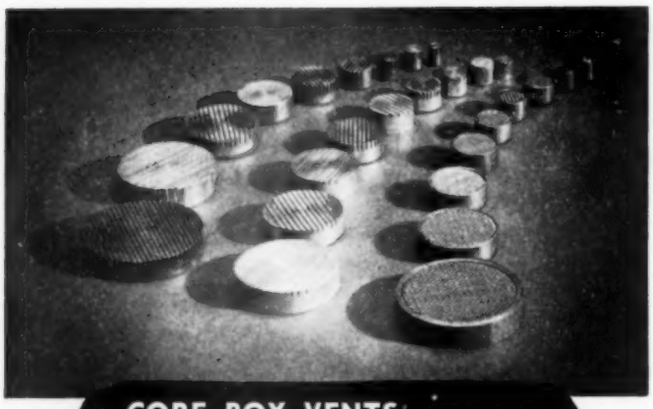

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Slot widths: .010", .013", .015"
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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Mesh: #30, #40, #50.
Diameters: 1/8", 3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4", 7/8", 1", 1 1/4", 1 1/2"

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Made in Standard Colors as Recommended by AFA.

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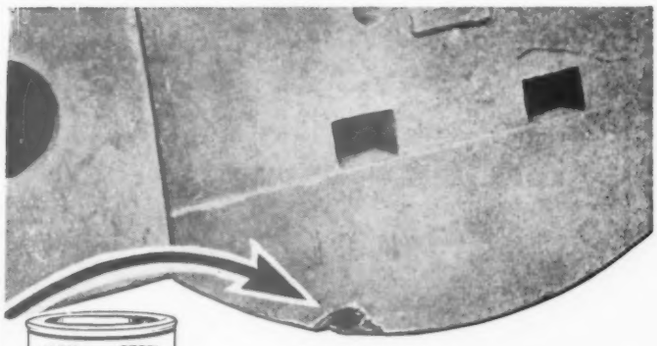

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SMOOTH-ON No. 4A
FOUNDRY CEMENT

How to Restore GOOD LOOKS to "Unlucky" Castings

Every once in a while, a good, sound, strong iron or steel casting is unlucky enough to come from the mold with slight surface imperfections. Pits, pockmarks, blow holes, sand holes or nicked contours are unsightly though harmless. Such unimportant blemishes can be trued up with Smooth-On No. 4 Foundry Cement—as used by foundrymen the past half century.

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If you are unacquainted with Smooth-On Foundry Cement and would like to test it on castings, we will send you a good-sized sample of any grade you select, if you'll mail the coupon below. We'll also include the 40-page Smooth-On Repair Handbook showing many other successful uses for Smooth-On Cements. Send today.

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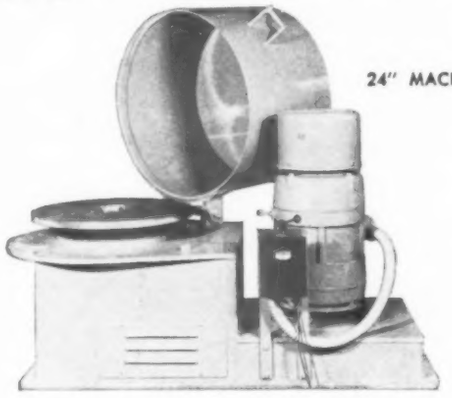
For better castings, increase furnace yield, less scrap, reduced machining cost.

We have engineers available to make complete studies to determine investment, production cost, and make recommendations.



24" MACHINE

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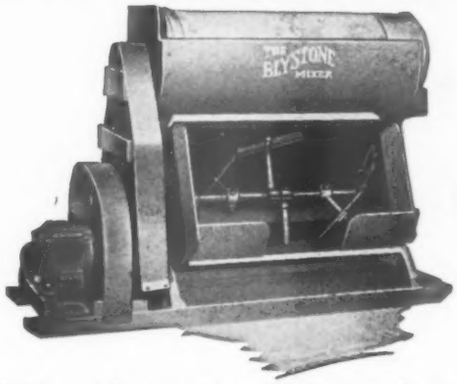
BLYSTONE
• MIXERS •



THE paddle-type mixer for core sand mixing in the foundry. Blystone Mixers offer: low mix cost, thorough mixing, and easy operation. There is a sturdily built type and size for your problem. Send for the new Bulletin and full details.

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clears the air in your foundry—improves working conditions . . .

AIRMOVER
carries off the heavy load of excess heat at pouring

AIRJECTOR
forces out smoke, fumes and fine dust

Create better AIR conditions in your foundry. It's as important as installing up-to-date technical and labor-saving equipment. Excess heat, smoke, fumes and fine dust can be removed through your roofs, through efficient, economical Swartwout Roof Ventilation.

AIRMOVER is ideal for large scale movement of heat from foundry pouring rooms. It gives you large heat exhaust capacity. Can be installed over large areas of roof without "loading" your buildings with high, heavy equipment.

AIRJECTOR supplies *power* ventilation—forces out contaminated air when placed over most active fume and dust centers. Rotating head and large, unobstructed throat provide efficient gravity flow when fan is not in operation.

● *Industrial plants of all types profit by Swartwout advice on ventilation problems. Write for information. See our catalog in Sweet's Architectural File.*

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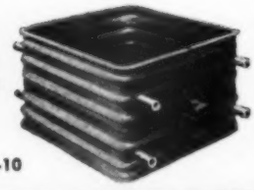
TEAMWORK

THAT SHOWS A FOUNDRY PROFIT SCORE

Truscon Foundry Flasks

OM-1



TM-10

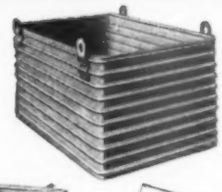
● Truscon Steel Foundry Flasks are right in there pitching wherever efficient production schedules must be met. They've got big-league features: Light Weight, Strength Where Needed, Durability, Proper Shapes and Sizes, Easily Rammed and Shaken Out. Write for descriptive catalog.

Truscon Steel Boxes and Skids can call the signals, catch the fast ones, and protect the home plate against costly scoring by production delays, waste, spoilage and other expense factors in materials handling and storage.

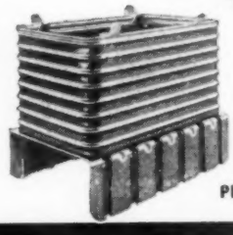
Truscon Steel Boxes and Skids assure more efficient storage of parts and materials, also more efficient movement and delivery of this material to production lines.

There'll be more man hours gained and more jobs completed when you use Truscon Steel Boxes and Skids. Write for descriptive catalog.

Truscon Steel Skids & Boxes



B-80C

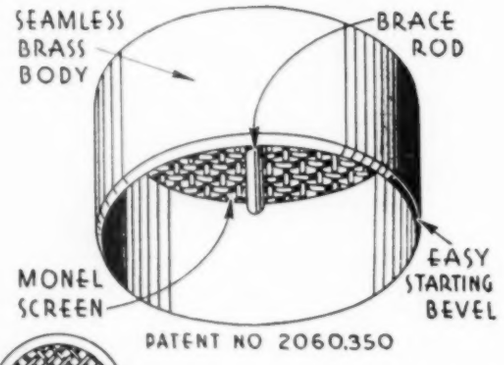


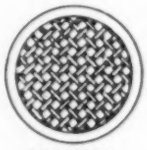
PB-120T

TRUSCON STEEL COMPANY, Pressed Steel Division

6100 Truscon Ave. • Subsidiary of Republic Steel Corp. • Cleveland 4, Ohio

SINEL SCREEN VENTS





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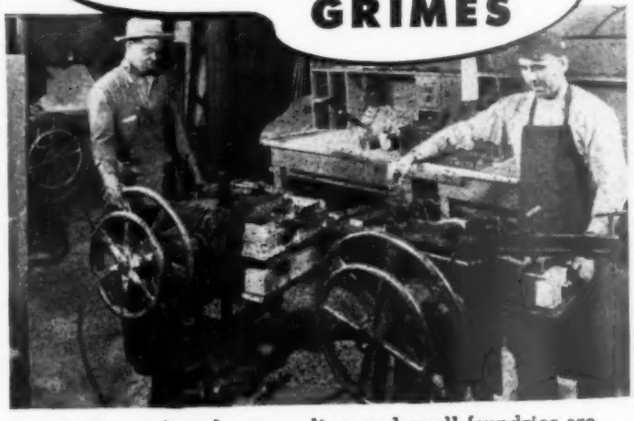

● Everywhere large, medium and small foundries are depending on Grimes Molding Machines to produce superior molds demanded by exacting foundrymen. Beside the Grimes Hand Rammed Roll-Over Machine (shown above) there are Hand Rammed Power Roll-Over Machines and Jolt Powered Roll-Over Machines to meet every molding need. Learn to *depend on Grimes* for *your* foundry needs. Ask for complete data.

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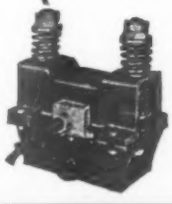

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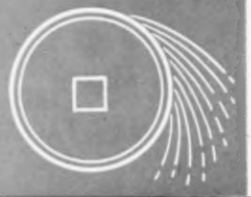

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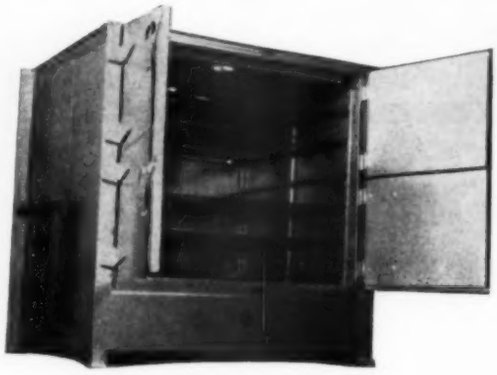

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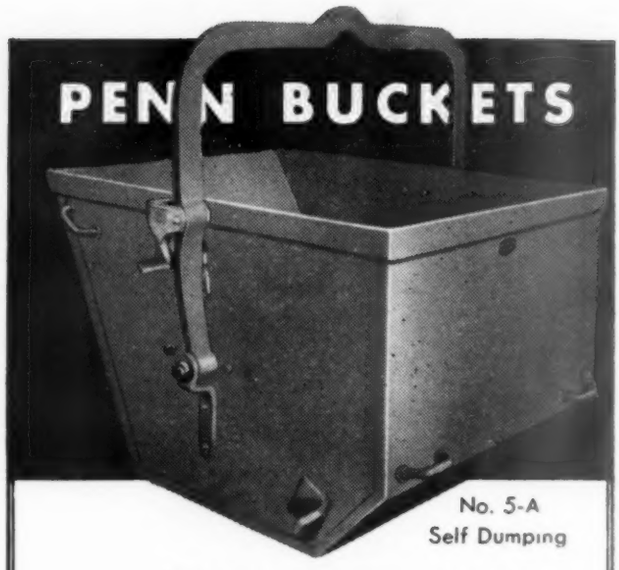

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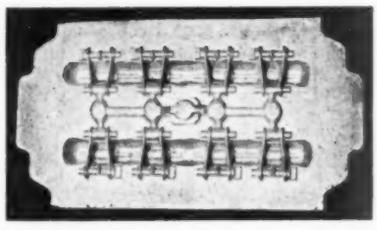

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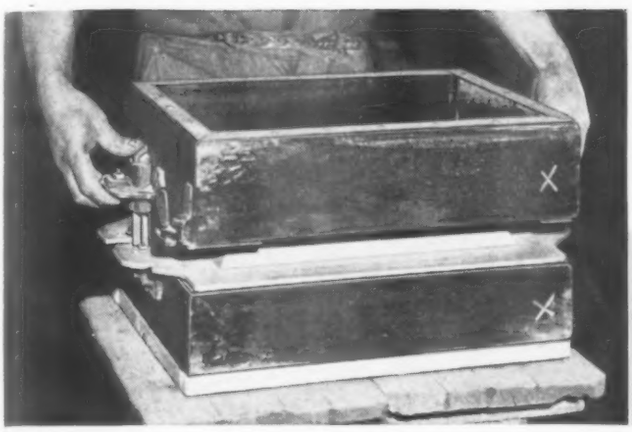
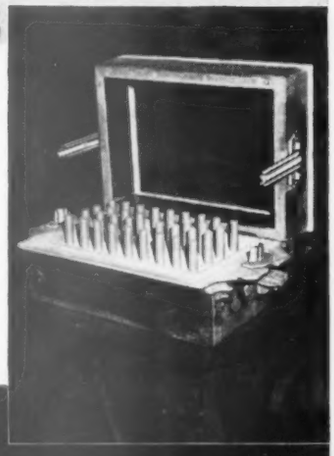


Eliminate Ruined Molds!

GET PERFECT LIFTS WITH BUCKEYE "Three-In-One" Flask Guides

(PATENTED)



Buckeye "Three-In-One" Patented Flask Guides positively prevent the cope from being rocked or shifted while being lifted from the drag!

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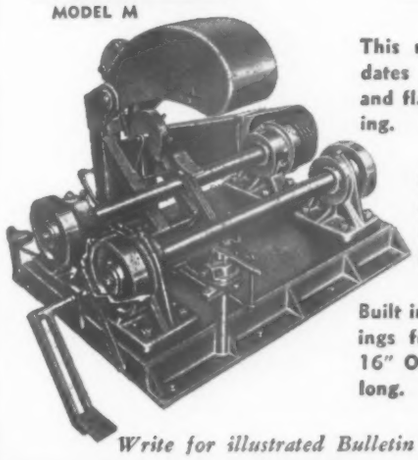
HORIZONTAL CENTRIFUGAL CASTING MACHINE

TO PRODUCE FERROUS and NON-FERROUS CASTINGS

MODEL M



This machine accommodates both metal molds and flasks for sand molding.

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Built in six sizes for castings from 1½" O.D. to 16" O.D. and up to 48" long.

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FORGE AND LOW PHOSPHORUS

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Established 1788

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This is a portable machine with three wheels, two in front, one in back, zerk fittings on all moving parts. Comes equipped with air gauge, pop-off gauge and a pin on top of the arm for a gate horn.

JOLT SQUEEZER

FULLY EQUIPPED

This machine is furnished in two sizes: 10" squeeze cylinder with 3" jolt cylinder and 12" squeeze cylinder with 4" jolt cylinder.

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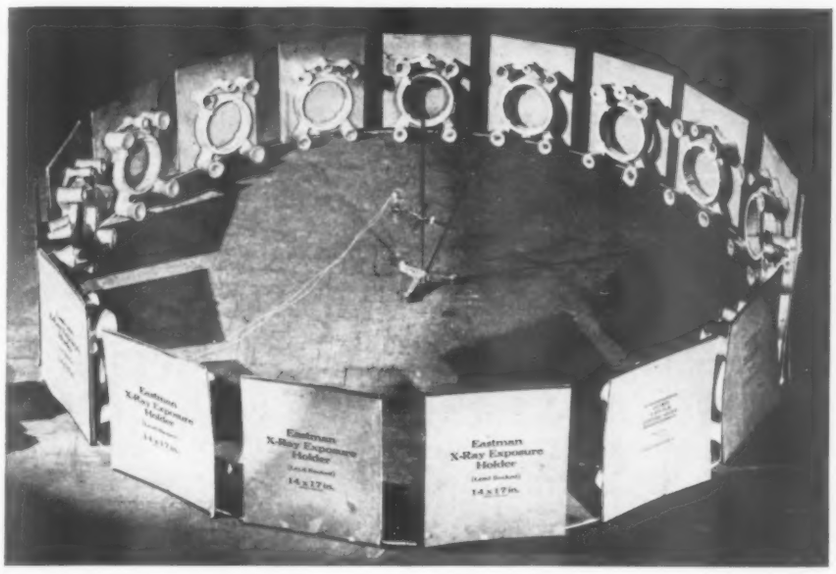

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"Directional solidification" can easily be studied by the set-up illustrated in the photograph—to indicate the best method of casting with a minimum of defects in the casting itself.

Radium has become a new foundry tool which directly effects an increase in yield. It permits accurate determination of the proper procedure in gating and risering "tough" castings. Seventeen cylindrical castings were radiographed simultaneously by Crane Co. to ascertain the most productive and economical foundry practice.

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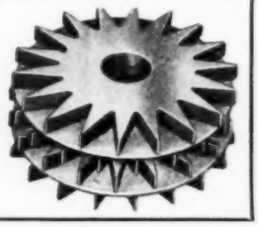

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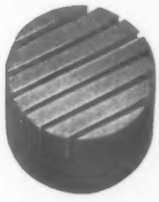
CORE  **BOX**

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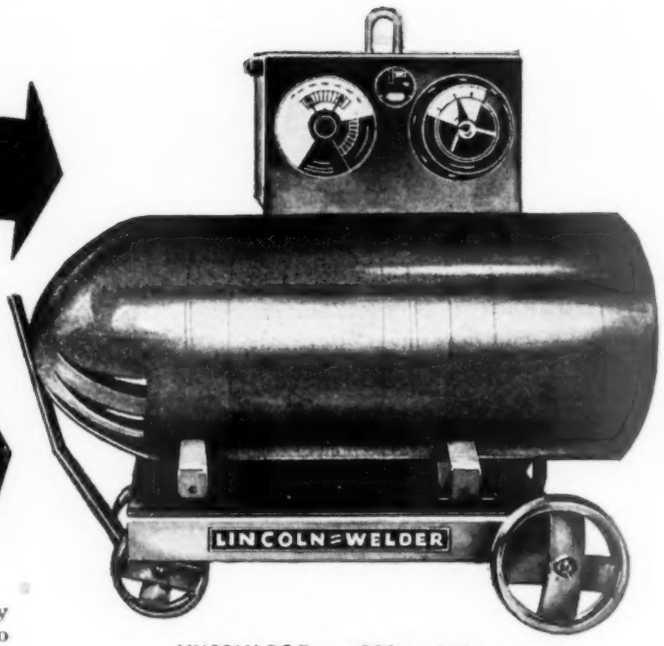

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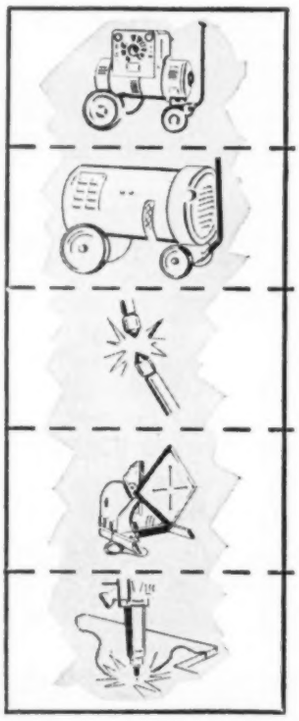

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Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis St., Philadelphia 24, Pa.
Stevens Inc., Frederic B., Detroit 26, Mich.
United States Graphite Co., Saginaw, Mich.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
General Blower Co., 406 N. Peoria St., Chicago 22, Ill.
Kirk & Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, O.

FEEDERS (Rotary)

Fuller Company, Catasaqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FERROBORON

Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Hickman-Williams & Co., Cleveland, O.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROMANGANESE

Bethlehem Steel Co., Bethlehem, Pa.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.

FERROMOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROSILICON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co., Jackson, Ohio.
Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILMS (X-Ray)

Eastman Kodak Co., Rochester, N. Y.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FIRE BRICK

Babcock & Wilcox, 85 Liberty St., New York 6, N. Y.
Carborundum Co., Perth Amboy, N. J.
Chicago Retort & Firebrick Co., 208 So. LaSalle St., Chicago 4, Ill.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Norton Co., Worcester 6, Mass.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis St., Philadelphia 24, Pa.
Stevens Inc., Frederic B., Detroit 26, Mich.

FIRE CLAY

Eastern Clay Products, Inc., Elfort, O.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., Guildhall Bldg., Cleveland 15, O.

FIRESTONE

Cleveland Quarries Co., Guildhall Bldg., Cleveland 15, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

CONVEYORS (Rubber)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Vibrating)

Ajax Flexible Coupling Co., Westfield, N. Y.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Syntron Company, Homer City, Pa.

COPPER

American Smelting & Refining Co., 120 Broadway, New York 5.

FLASKS (Aluminum)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.

FLASK FILLERS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave.,
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.

FLASKS (Slip)

Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Stevens, Inc., Frederic B., Detroit 26, Mich.

FLASKS (Steel)

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Youngstown 1, O.

FLASK FITTINGS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Truscon Steel Co., Youngstown 1, O.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.

FLASKS (Wood)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

FLEXIBLE SHAFT MACHINERY

Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Strand Co., N. A., 5001 N. Wolcott Ave., Chicago 40, Ill.
Wyzenbeek & Staff Inc., 838 W. Hubbard St., Chicago, Ill.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

American British Chemical Inc., 180 Madison Ave., New York 16.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Dockson Corp., 2832 E. Grand Blvd., Detroit 11, Mich.
Mathieson Alkali Works, Inc., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

FOUNDRY LAYOUT & METHODS

Associated Engineers Inc., 230 E. Berry St., Fort Wayne 2, Ind.
Lester B. Knight & Associates, 120 So. LaSalle St., Chicago 3, Ill.

FOUNDRY NAILS

Capewell Mfg. Co., Hartford, Conn.
Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SUPPLY HOUSES

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Inc., Elfort, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Hoffman Foundry Supply Co., 1193 Main St., Cleveland, Ohio.
Midwest Foundry Supply Co., Edwardsville, Ill.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis St., Philadelphia 24, Pa.
Stevens, Inc., Frederic B., Detroit 26, Mich.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.

FURNACES (Aluminum & Magnesium Billets) (con.)

Loftus Engineering Co., 610 Smithfield St., Pittsburgh 22, Pa.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Kirk Blum Mfg. Co., 2838 Spring Grove Ave., Cincinnati 25, O.
W. S. Rockwell Co., 56 Church St., New York 17, N. Y.

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Despatch Oven Co., Minneapolis 14, Minn.

FURNACES (Annealing)

Campbell-Hausfeld Co., Harrison, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Gehnrich Oven Div., W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Loftus Engineering Co., 610 Smithfield St., Pittsburgh 22, Pa.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Eclipse Fuel Engrg. Co., 711 So. Main St., Rockford, Ill.
Fen Machine Co., 1350 Babbitt Rd., Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Radiant Combustion Inc. Warren, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.

FURNACES (Electric Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Electric Melting) (Cont'd.)

Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Campbell-Hausfeld Co., Harrison, O.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Fen Machine Co., 1350 Babbitt Rd., Cleveland 17, Ohio.

FURNACES (Gas or Oil Fired) (con.)

Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Haynes Foundry Equipment Co., 1734 Lake St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Loftus Engineering Co., 610 Smithfield St., Pittsburgh 22, Pa.
Radiant Combustion Inc., Warren, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Loftus Engineering Co., 610 Smithfield St., Pittsburgh 22, Pa.
Maehler, Paul, Co., 2200 W. Lake St., Chicago 12, Ill.
Radiant Combustion Inc., Warren, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., W. Wilson St., Salem, Ohio.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit 7, Mich.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.

FURNACES (Nonferrous Melting) (con.)

Fen Machine Co., 1350 Babbitt Rd., Cleveland 17, Ohio.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Haynes Foundry Equipment Co., 1734 Lake St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, Ohio.
W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACE BLOWERS

Allen Billmyre Co., Mamaroneck, N. Y.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.
Ironton Fire Brick Co., Ironton, O.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., 300 W. Adams St., Chicago 6, Ill.
United States Graphite Co., Saginaw, Mich.

GAGES

Acme Aluminum Alloys Co. Inc., 232 N. Findlay St., Dayton 3, O.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st., Cleveland 5, O.

GAS

American Gas Association, 420 Lexington Ave., New York 17, N. Y.

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Liquid Carbonic Corp., 3110 S. Kedzie Ave., Chicago 23, Ill.

GAS BURNERS

Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Fisher Furnace Co., 5535 N. Wolcott Ave., Chicago 40, Ill.

GAS BURNERS (Cont'd.)

North American Mfg. Co., 2910 E. 75th St., Cleveland 4, O.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Willson Products Inc., Reading, Pa.

GRAPHITE

Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17, N. Y.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Keller Tool Co., Grand Haven, Mich.

GRINDERS (Surface, Bench, Disc, Floor)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Kindt-Collins Co., 12653 Elmwood Ave., Cleveland 11, O.
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Safety Grinding Wheel & Mach. Co., Springfield, O.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Mall Tool Co., 7720 South Chicago Ave., Chicago 19, Ill.
Safety Grinding Wheel & Mach. Co., Springfield, O.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Collmer Bros., 420 So. St. Joseph, South Bend, Indiana.
Desmond-Stephan Mfg. Co., Urbana, O.
Simonds Worden White Co., Dayton 7, O.
Western Tool & Mfg. Co., Springfield, O.

GRINDSTONES

Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Div. Cleveland Quarries Co.,

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co.,
American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Galion, O.
Carborundum Co., Niagara Falls, N. Y.

GRIT (Abrasive) (con.)

Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Simonds Worden White Co., Dayton 7, O.
Western Metal Abrasive Co., 2545 East 79th St., Cleveland 4, O.

HAMMERS (Chipping)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Keller Tool Company, Grand Haven, Mich.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

HEAT CONTROL AND RECORDING DEVICES

Foxboro Company, Foxboro, Mass.
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Lindberg Engineering Co., 2448 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Direct Fired)

Despatch Oven Co., Minneapolis 14, Minn.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

HEATERS (Gas, Oil, Electric)

American Foundry Equipment Co., Mishawaka, Ind.
Despatch Oven Co., Minneapolis 14, Minn.
Gehnrich Oven Div., W. S. Rockwell Co., 56 Church St., New York 7, N. Y.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Despatch Oven Co., Minneapolis 14, Minn.

HEATERS (Liquid, Steam)

Johnson Corporation, Three Rivers, Mich.

HEATERS (Space, Unit, Oven, Water)

American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Maehler, Paul Co., 2200 W. Lake St., Chicago 12, Ill.

HELMETS (Blasting)

American Foundry Equipment Co., 505 Byrkit St., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Gardner Drive, Quincy, Ill.

HOISTS (Air) (Cont'd.)

Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Keller Tool Company, Grand Haven, Mich.

HOISTS (Chain)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

HOISTS (Electric)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Conco Engineering Works, Mendota, Ill.
Modern Equipment Co., Port Washington, Wis.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

HOISTS (Hand)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Clipper Mfg. Co., 4030 Manchester, St. Louis, Mo.

HOSE (Air, Blasting, Water, Gas)

Gardner-Denver Co., Gardner Drive, Quincy, Ill.
Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Manhattan Rubber Mfg. Div. of Raybestos, Manhattan, Inc., 77 Townsend St., Passaic, N. J.
Pangborn Corp., Hagerstown, Md.
Schramm Inc., West Chester, Pa.

HYDRAULIC CLEANING EQUIPMENT

Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 208 W. 71st St., Cincinnati 16, O.

ILLUMINATORS (X-Ray Film)

Eastman Kodak Co., Rochester, N. Y.

IMPREGNATING SYSTEMS (Magnesium Castings)

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

INGOT MOLDS

Acme Foundry Co., Detroit 16, Mich.

INGOTS (Magnesium)

Dow Chemical Co., Midland, Mich.

INGOTS (Nonferrous)

Ajax Metal Co., Philadelphia 23, Pa.
Aluminum Company of America, Pittsburgh, Pa.
Aluminum & Magnesium Inc., Sandusky, O.
American Smelting & Refining Co., 120 Broadway, New York 5.
Apex Smelting Co., Chicago, Ill.
Cleveland Electro Metals Co., W. 38th St. & NP RR. Cleveland 13, O.
Federated Metals Div., American Smelting & Ref. Co., New York 5.
General Smelting Co., Philadelphia, Pa.
International Nickel Co., Inc., 67 Wall St., New York City 5.
Jobbins, Wm. F., Inc., Aurora, Ill.
Lavin & Sons R., Inc., Chicago, Ill.
National Smelting Co., Cleveland, O.
Niagara Falls Smelting & Refining Corp., 2204 Elmwood Ave., Buffalo 17, New York.

INGOTS (Nonferrous) (Cont'd.)

Silverstein & Pinsof, Inc., 1720 N. Elston, Chicago 22, Ill.
Sonken-Galamba Corp., Kansas City, Kan.
U. S. Metals Refining Co., New York.
U. S. Reduction Co., E. Chicago, Ind.
Western Metal Co., 3201 S. Kedzie Ave., Chicago 26, Ill.

INSUATORS (for casting heads)

Houghton Co., E. F., Philadelphia, Pa.

IRON CEMENT

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE

Bethlehem Steel Co., Bethlehem, Pa.
Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.

JACKETS (Mold)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 1324 Hird Ave., Cleveland 7, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

LABORATORY EQUIPMENT (Chemical)

Buehler, Ltd., 228 N. LaSalle St., Chicago 1, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Laboratory Equipment Corp., Benton Harbor, Mich.

LABORATORY EQUIPMENT (Physical)

Buehler, Ltd., 228 N. LaSalle St., Chicago 1, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Laboratory Equipment Corp., Benton Harbor, Mich.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Norton Co., Worcester 6, Mass.

LADLES

Bethlehem Steel Co., Bethlehem, Pa.
Haynes Foundry Equipment Co., 1734 Lake St., Kalamazoo 21, Mich.
Industrial Equipment Co., Minster, O.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 26, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE HEATERS

Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS

Chicago Retort & Firebrick Co., 208 So. LaSalle St., Chicago 4, Ill.
Ironton Fire Brick Co., Ironton, Ohio.

LATHE CENTERS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

LEAD

American Smelting & Refining Co., 120 Broadway, New York 5.

LIMESTONE

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Delta Mfg. Co., Industrial Division, 620 E. Vienna Ave., Milwaukee 1, Wis.
Oliver Machinery Company, Grand Rapids 2, Mich.

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Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

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American Foundry Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., The, 2541 N. Keeler Ave., Chicago 39, Ill.
Blystone Division Standard Sand & Machine Co., 549 W. Washington Blvd., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Corp., Waterloo, Iowa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.

SAND PREPARATION EQUIPMENT
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Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee 1, Wis.

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Baker Perkins Inc., Saginaw, Mich.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2541 N. Keeler Ave., Chicago 39, Ill.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Clearfield Machine Co., Clearfield, Pa.
Grimes Molding Machine Co., 1429 Virginia Park, Detroit 6, Mich.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Royer Foundry & Machine Co., Kingston, Pa.
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Chicago Pneumatic Tool Co., General Offices: 8 East 44th St., New York 17, N. Y.
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Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Keller Tool Co., Grand Haven, Mich.

SAND RECLAIMERS
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Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
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Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

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Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio
Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co., Leavenworth, Kansas.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.
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Simplicity Engineering Co., Durand, Mich.
Pangborn Corp., Hagerstown, Md.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

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Beardsley & Piper Co., The, 2541 N. Keeler Ave., Chicago 39, Ill.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
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National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Neff & Fry Co., Camden, O.

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SAWS (Cold Metal)
Bethlehem Steel Co., Bethlehem, Pa.
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SAWS (Masonry)
Clipper Mfg. Co., 4030 Manchester, St. Louis, Mo.

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Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6, Ill.
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Schramm, Inc., West Chester, Pa.

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Globe Steel Abrasive Co., Mansfield, Ohio.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
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Western Metal Abrasive Co., 2545 E. 79th St., Cleveland 4, O.

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Help Wanted

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Experienced in taking charge malleable, gray iron and brass foundry. Age 36, married. Metallurgy and sand control experience. Good labor relations. New England preferred. Address: Box 579, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Permanent mold aluminum foundryman and metallurgist with 20 years' experience desires connection with small organization for full or part time. Familiar with all phases of permanent mold work. Address: Box 565, The FOUNDRY, Cleveland 13, Ohio.

PRODUCTION SUPERINTENDENT
OF
DIRECTOR RESEARCH

Graduate metallurgist. Twenty-five years' experience production and research in ferrous, nonferrous and cast iron fired from actual machining of ingots to finished product. Well versed in latest technique molding, sand control and in all furnace operation. Wide knowledge of both static and centrifugal castings. Prefer East. Address: Box 576, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Practical foundryman with thorough experience in molding, coremaking, cupola practice and making of high tensile gray iron and alloy castings. Address: Box 581, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

CORE ROOM SUPERINTENDENT

Twenty-five years' experience as superintendent in production and jobbing foundries producing quantity and quality work. Experienced in all phases of core work and machinery, specializing in sand mixing, core baking and blowing machines. Prefer Southwestern States. Address: Box 512, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR ASSISTANT

Foundryman with eighteen years' experience as metallurgist, foreman and troubleman in automotive, gray iron and malleable foundries, desires to make change. College and technical training, best of references. Position desired in Northern Ohio or Michigan. Address: Box 584, The FOUNDRY, Cleveland 13, Ohio.

PRACTICAL FOUNDRYMAN

With many years' experience in Gray Iron, Semi-Steel, Alloys and Meehanite asks—are you having any trouble with sand control, mixtures, cupola practice, etc. I am available for whatever period of time is necessary to correct the trouble. Reasonable terms. Address: Box 568, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY ENGINEER

Diversified experience in gray iron and steel. Outstanding record of accomplishment trouble shooting on production. Skilled in foundry layout, plant design and mechanization. Well versed on scientific melting and mixing. Address: Box 571, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM FOUNDRY ENGINEER and EXECUTIVE

Graduate metallurgist with thirteen years' experience in aluminum, sand and permanent mold foundry work. Record includes technical, metallurgical, supervisory and managerial experience. Would like position with progressive company. Address: Box 567, The FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY SUPERINTENDENT

Twenty-seven years of learning and applying knowledge gained in producing steel castings. The problems of both labor and management has always had my sincere interest and have acquired a sound knowledge in dealing with labor. Age 45 years. Address: Box 575, The FOUNDRY, Cleveland 13, Ohio.

FOREMAN

Man with 20 years' experience as foundryman desires position as foreman in nonferrous or gray iron foundry. Practical molder on light production and jobbing. Knowledge of machine molding, soil pipe and fittings. Also making match plates. Address: Box 577, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Age 28, Naval officer, being released from service. Four years' industrial experience, including production and development work on the casting, heat treatment, welding and fabrication of steel and gray iron. Two and one-half years' Navy experience in steel foundry. Wish to reenter industry in a production, development or technical service capacity. Minimum salary: $5000 per year. Available April. Address: Box 569, The FOUNDRY, Cleveland 13, Ohio.

BRASS FOUNDRY FOREMAN

Capable man 33 years old. Eleven years' experience in dry and green sand. Foreman on pattern making and foundry. Experience with yellow brass, bronze, aluminum and manganese bronze. Address: Box 507, The FOUNDRY, Cleveland 13, Ohio.

GRADUATE METALLURGICAL ENGINEER

Twenty-eight, married. Naval officer, available May 15. Experience includes 3 years' commercial steel heat-treating plant, as production metallurgist; 3 years' nonferrous smelting and foundry work. Has been concerned with plant and laboratory control; executive and personnel experience. Address: Box 580, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT

Steel or high alloy. Twenty-one years' practical and technical experience in handling all departments. Capable of organizing and managing a plant to make money. Address: Box 557, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Forty years of age with twenty years' experience in grey iron jobbing business. Thoroughly grounded in all phases of foundry practice. Prefer medium casting production, either on squeezer or rollover machine. Address: Box 552, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Wide experience, 24 years in full charge of foundries. Practical molder and core maker. Medium and heavy high grade machinery and jobbing castings, gray iron and semi-steel, green and dry sand. Well versed in metallurgy. Address: Box 550, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER OR SUPERINTENDENT

McLain Graduate of Milwaukee. Practical foundryman with many years' experience in Gray Iron Cupola or Electric Furnace and nonferrous metals—light, medium and heavy castings. Understand foundry from molding, core room, grinding room to shipping room. A-1 foundryman. Age 44 with best references. Employed as foundry superintendent. Address: Box 339, The FOUNDRY, Cleveland 13, Ohio.

EXPERT IN STEEL METALLURGY

Polish citizen, age 39, intending to reside in United States as from July and apply for naturalization papers seeks responsible position with prominent foundry firm. Author of book and papers on foundry work and metallurgy and holder of several patents. High references available. Would also consider partnership as foundry consulting engineer. Address: Box 556, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Iron-steel noferrous. Up to date. Practical and technical. Handle fully any size. American, age 60. Now located in the Northwest. Address: Box 624, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY EXECUTIVE

Now employed wishes to make a change. Has had years of experience. Unusual background of experience both in the foundry and the completion of the product. Have excellent reputation for developing new methods. Forty-one years of age, married and family. Address: Box 330, The FOUNDRY, Cleveland 13, Ohio.

ATTENTION MANUFACTURERS

Government Sales Representative with offices in Washington, D. C. and with products on General Schedule of Supplies is desirous of adding another item to his line. Sales record and background will stand rigid investigation. Address: Box 554, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT

Thoroughly qualified practical gray iron and nonferrous foundryman. Twenty-five years' experience in all phases of foundry practice, producing highest quality castings of light to heavy in general jobbing and high production. Now employed but desirous of relocating in Middle West with reliable company needing a good practical foundryman. Address: Box 587, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY CHEMIST-METALLURGIST

Fifteen years as superintendent, metallurgist, chief chemist, foreman heat treating; labor management relations, production schedules, quality control; stainless steel, electric furnace gray iron, bronze; light, medium weight pressure castings. Know melting, sand control, molding, core making, gates, risers, heat treating. Want permanent connection, good future. Address: Box 574, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY PRODUCTION SUPERVISOR

Supervisor of foundry production for 25 years. Special experience in planning and production control. Vicinity of Michigan. Address: Box 863, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

SUPERINTENDENT

Grey iron, small and medium. Technical graduate. Experienced in sand control, cupola practice and production molding. Ten years' foreman and superintendent. Age 42. Address: Box 588, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Twelve years' experience as chemist, metallurgist gray iron jobbing foundries. Know melting, pouring, gating, risering sand control, molding practice for machine tool and pressure castings up to 25 tons. Desire midwest location. Address: Box 538, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY MANAGER

Capable, progressive gray iron foundryman with successful record as Foundry Superintendent qualified to manage and direct all foundry activities. Twenty-eight years' practical experience and technical knowledge, producing heavy machinery and diesel engine castings with proven ability developing and applying modern methods and scientific controls over all operations. Address: Box 566, The FOUNDRY, Cleveland 13, Ohio.

BRASS FOUNDRY FOREMAN

Practical experience on high grade work including chandelier castings, grave markers, ornamental bronze, hardware, steam valves, jobbing and production work. Prefer position with manufacturing plant. Address: Box 472, The FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

Gray iron or aluminum, organizing ability. Excellent labor relations, aggressive and reliable. Nineteen years' experience in automotive and jobbing. Can rig and gate. Age 39. Prefer Midwest. Address: Box 558, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN or SUPERINTENDENT

Brass, aluminum or steel. Practical coremaker, molder and melter. Good rigger and get along well with all types of labor. Address: Box 586, The FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED POSITIONS

$2,500-$25,000

This thoroughly organized confidential service of 36 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 Dun Bldg. Buffalo 2, N. Y.

GRAY IRON FOUNDRY EMPLOYMENT

We are receiving many inquiries for superintendents, metallurgists and foremen. We shall be glad to hear from qualified men. No charge

Gray Iron Founders' Society Inc.
1010 Public Square Building Cleveland, Ohio

Accounts Wanted

STEEL OR MALLEABLE ACCOUNT

For Metropolitan area of Philadelphia by well established manufacturer's agents familiar with foundry practice.

BOX 564

THE FOUNDRY CLEVELAND 13, OHIO

ACCOUNTS WANTED

Foundry Equipment and Supplies
ILLINOIS—INDIANA—WISCONSIN.

Foundry executive with 25 years' experience sales and operating will establish sales agency with Chicago office. Wide acquaintance, adequate representation. Address: Box 559, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Foundry Work Wanted

Designers and Builders of
PERMANENT MOLDS
for production castings from kitchen utensils to engines.

WAGNER PERMANENT MOLD CO.
2910 EMPIRE AVE.
BURBANK, CALIF.

Foundries For Sale

FOUNDRY FOR SALE

Situated at the foot of the Rockies completely equipped iron, bronze and aluminum foundry 170 ft. x 170 ft. balcony on three sides. All the orders you can handle. Equipment includes cupola, two bronze furnaces, sandblast, power saw, grinders, 2 core ovens, compressor, electric elevator. Owner has bad health. $12,000. Address: Box 582, The FOUNDRY, Cleveland 13, Ohio.

Correspondence Course

THE CUPOLA IS THE HEART OF THE FOUNDRY

Turn the searchlight of McLain's System on your cupola. 90c of every dollar is spent before melting begins—but some make it look like 30c by indifferent melting. Are you using the maximum percentage of steel scrap in your castings? If not, why not? The value of the scrap pile lies in the fact it offers you food for thought. Our system is worth the fee as a desk reference. Synopsis free.

McLAIN'S SYSTEM INC.
236 E. NORTH AVE., MILWAUKEE 12, WIS.

Capacity Wanted

WANTED

Foundry to make small gray iron castings. Can give contract for 350 to 500 ton first year. Pattern plates furnished. Address: C. G. S., P. O. Box 31, Oconto, Wis.

Open Capacity

FOUNDRY CAPACITY AVAILABLE

Modern gray iron foundry able to take on production work in castings from 300 pounds to five tons each. Write or wire quantities desired. Capacity available at once. Address: Lufkin Foundry & Machine Co., Lufkin, Texas.

OPEN CAPACITY

Jobbing foundry has open capacity for sand cast, light to medium weight aluminum castings. Address: Reddig Aluminum Foundry, 3417 9th St., Rock Island, Ill.

OPEN CAPACITY

Our foundry has open capacity to supply small and medium size aluminum castings. Address: Arcanum Aluminum Foundry, 110 North High Street, Arcanum, Ohio, Phone 158 M.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample or prints. Address: Oregon Castings Co., R. D. 3, Lititz, Pa.

Wanted-To-Buy

WANTED

Cupola Blower, 28 to 32 oz. Pressure. Address: Box 527, The FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

WANTED

Detroit Electric Rocking Furnace
3000 lbs. capacity cold melt
6000 lbs. capacity duplex
Complete with control panels and transformers.

FRANK FOUNDRIES CORP.
MOLINE, ILL.

WANTED
ELECTRIC FURNACE—½ TON

Electric melting furnace with controls and transformer. Furnish age, condition, electrical data, price, etc. Address: Box 563, The FOUNDRY, Cleveland 13, Ohio.

WANTED

American Gasoline Sand Cutter same as or similar to Model AA712, size 62". Inside width of wheels, rim to rim 65", outside width 72". Overall width not more than 7' 5", cutting wheel 52". Address: SANITARY CO. OF AMERICA, LINFIELD, PA.

WANTED
FOUNDRY TO RENT

With option to buy. Large enough for ten tons of castings. In New York state or Pennsylvania. Address: Box 530, The FOUNDRY, Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

One ladle, 6000 lbs. capacity, for gray iron foundry. Ladle complete with bale, hand wheel and gear mechanism for tilting.

WM. R. THROPP & SONS CO.
P.O. BOX 853
TRENTON, N. J.

WANTED

Small Wheelabrator, preferably 20" x 27", tumble blast. State price, running condition and any other details. ADDRESS: NATIONAL FOUNDRY & PATTERN CO., 1440 SUMMER ST., HAMMOND, IND.

WANTED TO BUY

Complete set of bushing patterns and plug patterns, American standard. Address: Box 531, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Tensile Testing Machine, capacity up to 100,000 lbs. Address: Box 589, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

FOR SALE

A well equipped machine shop with brass and gray iron foundry. Located in Indiana. Has well established products with excellent postwar opportunities.

BOX 560

THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY SUPPLIES AND EQUIPMENT

We would like to add additional Foundry Supplies and Equipment lines to our business. Any manufacturer interested in distribution in the Minneapolis and St. Paul, Minnesota area please write: Box 525, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

OPPORTUNITY

We can furnish empty tight and slack wooden barrels also steel drums for your products. ADDRESS: BUCKEYE COOPERAGE STATION C.P.O. BOX 1501, CLEVELAND, OHIO.

ALUMINUM
CASTING WORK WANTED

Also jobbing and aluminum match plates made from master patterns. Immediate delivery. Address: C. I. LEE AND SONS, ALUMINUM FOUNDRY, FARLEY, IOWA.

For Sale

REBUILT EQUIPMENT

Power Screw Cutter

60 HP New Dutton Economist Boiler never used cost $3520 save 10%

Air Hoist

Core Machine

Grinding Standard

Sand Blast Tank

Air Compressor — Pennsylvania 25 HP with starter — completely rebuilt

4 Jolt Squeezers fine shape $250 each

Oil fired furnaces 70's & 80's

R. B. GETZLOFF & SON BURR OAK, MICH.

PHONE 32

GOOD USED EQUIPMENT

9' Clearfield Underdriven Wet Pan, self discharging with Morse Silent Chain Drive.
Hassel Safety direct Foundry Swing Grinder Motor 15 HP, 230 volts DC.
Hisey-Wolf Double and Snagging grinder, Motor ball bearing 5 HP, 230 volts DC.

IRA C. JORDAN
2508 EAST BELLEVIEW PLACE
MILWAUKEE 11, WISCONSIN

FOR SALE

Molding Machine
49" x 84" Table
with 16" pattern draw
International Type F
Roll-over Jolt
Used only 6 months.

WAYNE FOUNDRY CO.
DETROIT 10, MICH.
TEL. LAFAYETTE 8226

FOR SALE

Two Lindberg Electrical Cyclone Tempering Furnaces Type 3336 EH including Quench Tank, Heating Burner, all safety valves, control panels and handling equipment. Like new. For full information write:

GILBERT BRASS FOUNDRY COMPANY
5036 FARLIN AVE.
ST. LOUIS 15, MISSOURI

FOR SALE

1—3000 lb. Herman Jolt, Roll-over and Draw Machine of the following specifications: Heavy Duty Bumper, 40 x 50", 13" dia. solid cylinder. Turn-over plate, 50 x 56", 15" cylinder complete with 2 Flask Air Clamps and Rear Discharge Roller Conveyor. This machine was purchased in 1942, was used on war work for only one year and is in A-1 condition. For further particulars address: WHITIN MACHINE WORKS, WHITINSVILLE, MASS.

Classified Advertising

For Sale

FOR SALE
MOLDING MACHINES

1—12" x 16"—8" Draw Type T.J. International Jar Ramming Power Stripping Molding Machine Serial No. 16937
1—16"—4" Draw Type H.J. International Jar Ramming Hand Turn-Over Foot Draw Molding Machine Serial No. 13347
1—16"—4" Draw Type H.J. International Jar Ramming Hand Turn-Over Foot Draw Molding Machine Serial No. 23141
1—20" — 8" Draw Type G International Jar Ramming Power Turn-Over Foot Draw Portable Molding Machine Serial No. 04761
1—20" x 26"—8" Draw Type J.W.P. International Jar Ramming Power Stripping Molding Machine Serial No. 16123
1—24"—10" Draw Type G International Jar Ramming Power Turn-Over Foot Draw Molding Machine Serial No. 13688
1—24"—10" Draw Type G International Jar Ramming Power Turn-Over Foot Draw Molding Machine—No Serial Number
1—#45 P Osborn Little Wonder Hand Roll-Over Molding Machine Serial No. 5579-F
3—#46 P Osborn Little Wonder Hand Roll-Over Molding Machines Serial Nos. 4893-P, 5329-C, & 5964-G
6—#151 P Osborn Drop Plate Molding Machines Serial Nos. 2002-L, 2875-A, 5578-A, 5578-B, 5933-C, & 5933-D
1—#152 Osborn Drop Plate Molding Machine Serial No. 6841-B
1—#558 Osborn Jolt Stripper Molding Machine with 20" x 32" Table Serial No. 7620

Core Blowing Machine

1—#92 Osborn Core Blowing Machine Serial No. 9562-C

Sand Blast Equipment

1—Size 8' #TR New Haven Table Type Sand Blast Room complete with New Haven Direct Pressure Sand Blast Tank

MISCELLANEOUS FOUNDRY SUPPLIES

Approximately 500 lbs. No. 13 gauge 1½" stem, with ¼" double nicked shoulder, square head, Fanner radiator chaplets.
400 lbs. No. 15 gauge 1½" Swedish iron stem with ¼" double nicked shoulder cross head Fanner radiator chaplets.

THE G. & C. FOUNDRY CO.
W. MONROE & OLDS STS.
SANDUSKY, OHIO

CENTRIFUGAL COMPRESSORS AND BLOWERS

2100 CFM GE with 10 HP 3/60/3450 RPM motor.
1200 CFM Buffalo, 9½ x 7 x 7¼ with 7½ HP, 220/3/60 1750 motor.
20¼ x 16¼ x 18¼ Allington and Curtis No. 55 (belt drive).
10½ x 10½ American size 5, (belt drive).
(2) 8 x 8 Sturtevant size 21061-9 (belt drive).

THE MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVE., CLEVELAND 14, OHIO

FOR SALE

1—Style 625 Hausfeld gear tilting crucible furnace lined with high grade fire brick backed with insulation to accommodate No. 225 long lip crucible complete with swing top arrangement, No. S262 burner nozzle with 2-5/16" orifice for natural gas fuel and 16 oz. air pressure, with No. 316-C2-2 North American blower direct connected to 2 HP 220 volt, 60 cycle 3 phase AC motor with starter. Furnace used less than 90 days still has original lining and crucible.
1—Complete set extra linings
5—Extra covers
7—No. 225 Tercod Crucibles

First check for $800.00 takes all complete, F. O.B. Sheridan, Wyoming.

SHERIDAN IRON WORKS, INC.
SHERIDAN, WYOMING

REBUILT
BLOWERS—FANS—EXHAUSTERS

Centrifugal blowers for gas and oil burning Sand blast, grinders and dust exhausters Roots-Connersville positive cupola blowers Welding fume exhausters—Ventilating fans.

GENERAL BLOWER CO.
8601 FERRIS AVE.
MORTON GROVE, ILL.

For Sale

FOR SALE

1—Model NC2 Royer Sand Separator in good condition.
1—No. 4 Roots-Connersville P sitive Cupola Blower in good running condition.

P. H. MAGIRL FOUNDRY & FURNACE WORKS
413 E. Oakland Ave.
Bloomington, Ill.

FOR SALE

1—5 ton overhead crane, 30'9" span, three spare motors—$2,000.00.
1—7½ ton overhead crane, 30'9" span, AC current—$2,500.00.

ST. LOUIS STEEL CASTING CO.
100 MOTT STREET
ST. LOUIS 11, MO.

FOR SALE

One new Lindberg Electric production type magnesium heat treating furnace complete. Address: Box 570, The FOUNDRY, Cleveland 13, Ohio.

REBUILT EQUIPMENT

Molding machines, all types; tumbling mills; furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers; sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 LAKE ST. KALAMAZOO 21, MICH.

FOR SALE

A well-equipped brass and gray iron foundry. Location Northwestern Ohio. Address: Box 468, The FOUNDRY, Cleveland 13, Ohio.

Are **YOU** in need of foundry equipment?
Do **YOU** have equipment to sell?
Are **YOU** looking for experienced men?
Do **YOU** want to obtain a position?
If **"Yes"** is your answer to any of the above questions, may we offer the services of the Classified Advertising Department of The FOUNDRY?

POSITION WANTED

Minimum advertisement set solid, 30 words $1.50. Additional words 5c each.

HELP WANTED

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

FOR SALE

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

WANTED

Minimum advertisement set solid, 30 words or less $3.00. Additional words 10c each.

Miscellaneous advertisements such as "Personals", "Services" etc., minimum 30 words set solid, $3.00. Additional words 10c each.

Forms close 13th of month preceding issue

Note: If replies are to be sent to a box number in care of The FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all caps, add 50% to above rates.

For Sale

REBUILT EQUIPMENT IN STOCK

Molding Machines
2—International Type F 24" x 10" Stationary Power Jolt, Rollover, and 10" draw.
2—International Type F 26" x 12" Stationary Power Jolt, Rollover, and 10" draw.
2—International Type M 24" x 10" Portable Power Jolt, Hand Rollover and Draw.
1—Osborn No. 450 Stationary Jolt Stripper.
1—Osborn No. 405 Stationary Jolt Rollover with 9" draw cyls.
1—Pridmore Type V Style AV Jolt Rollover Draw 48" x 74" Table 4000 lbs. capacity.
4—Arcade Modern No. 2-38 Portable or Stationary Hand operated Squeeze Rollover Draw with swing out table.
5—Mumford 3" cyl. Core Jolt with 20" x 15" table.
Several plain air squeezers.

Metal Melting Equipment
1—Whiting Style Cupola 41" dia. shell.
New 32" to 41" dia. shell cupolas made to order.
1—Monarch Tilting Iron Pot Aluminum Furnace 100 lbs. cap. Gas or Oil.
2—Hausfeld Tilting Crucible Aluminum Furnaces 33" dia. shell. Gas or Oil.
2—Hausfeld Open Flame Tilting Brass Furnaces 400 lbs. cap. Gas or Oil.
2—Monarch-Rockwell Rotating 500 lbs. brass. Oil

Blowers for Cupolas and Furnaces
1—6.0 Cu. Ft. per rev. Rotary Blower.
1—19 Cu. Ft. per rev. Rotary Blower.
Maxon-Premix Blower Sets for Gas ⅛ to 1 H.P. Motor Driven Centrifugal blowers to 2 lbs. press. Belt Driven Centrifugal blowers for Cupolas.

Tumbling Mills and Sand Blast
1—McLeod 36" x 36" Sand Blast Barrel with Suction sand feed.
1—McLeod 36" x 36" Sand Blast Barrel with bucket sand elevator to press. generating tank.
1—McLeod Sand Blast Generating Tank.
1—McLeod Cloth Screen Dust Collector.
1—Swartwout Car Type Core Oven with Insulated Steel walls, 6½' x 7' x 11' inside dimen. 5' x 6½' Door. Gas Fired. One Car Included.
1—4000 lbs. cap. Worm Geared Crane Ladle.
Air Compressors 1 to 60 H.P.

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

FOR SALE

25 sets cast steel flasks size 24" x 25" x 8½" drag and 11" cope. Pin centers are 27½". Call or write:

DIAMOND TOWMOTOR CAR COMPANY
4401 W. 26TH STREET
CHICAGO 23, ILLINOIS
PHONE: LAWNDALE 2600
MR. W. A. BREINIG

FOR SALE

1 American Wheelabrator, Size 27 x 36. Complete with motors and loading skip. 2 years old. Price $3,000.00.

NOBLESVILLE CASTINGS COMPANY
NOBLESVILLE, INDIANA

FOR SALE

1—Osborn Little Wonder Core Machine $25.00.
1—International Jolt Strip Pin Lift table 28 x 32", pin center 20 x 18" to 20 x 28". $265.00.
2—SPO Jolt Rollover No. 506, 24" flask width, 600-lb. capacity, power draw. $265.00.

BOX 585
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE
IMMEDIATE DELIVERY

1—No. 2 Schwartz tilting brass furnace 500 lbs. Capacity complete with gas mixing manifold.
1—23 foot diameter circular mold conveyor complete with mold rack.

ELMIRA LUBRICATOR CO., INC.
ELMIRA, NEW YORK

Classified Advertising

For Sale

OVERHEAD CRANES

200 Ton Alliance 100′ Span
175 Ton Morgan 54′ Span
150 Ton Whiting 30′ Span
80 Ton "American" 40′6″ Span
75 Ton Alliance 37′ Span
75 Ton Alliance 78′ Span
50 Ton Cleveland 71′10½″ Span
50 Ton Shaw 69′10″ Span
40 Ton Alliance 82′ Span
35 Ton Northern 22′ Span
30 Ton Case 41′ Span
30 Ton Morgan 30′ Span
30 Ton Morgan 77′ Span
30 Ton Niles 53′9″ Span
30 Ton P&H 80′ Span
30 Ton Reading 56′ Span
25 Ton Bedford 50′ Span
25 Ton Cleveland 106′ Span
25 Ton P&H 70′ Span
25 Ton Whiting 106′ Span
25 Ton Whiting 82′ Span
25 Ton Whiting 56′ Span
20 Ton Alliance 77′ Span
20 Ton Cleveland 65′ Span
20 Ton Morgan 77′ Span
20 Ton Northern 60′ Span
20 Ton P&H 39′6″ Span
20 Ton P&H 51′4″ Span
20 Ton Shaw 76′4″ Span
20 Ton Shepard Niles 49′6″ Span
20 Ton Shaw 76′4″ Span
15 Ton Alliance 50′ Span
15 Ton Alliance 35′ Span
15 Ton Cleveland 55′6″ Span
15 Ton Cleveland 35′ Span
15 Ton Morgan 77′ Span
15 Ton Niles 32′ Span
15 Ton Northern 53′ Span
15 Ton Shaw 82′ Span
15 Ton Shaw 77′ Span
15 Ton Toledo 82′ Span
15 Ton Whiting 74′8½″ Span
15 Ton Whiting 71′10½″ Span
12 Ton Morgan 56′ Span
10 Ton Alliance 58′9″ Span
10 Ton Alliance 71′10″ Span
10 Ton "American" 27′ Span
10 Ton Cleveland 38′ Span
10 Ton Cleveland 50′ Span
10 Ton Emsco 30′ Span
10 Ton Lane 50′ Span
10 Ton Morgan 39′5″ Span
10 Ton Morgan 77′ Span
10 Ton P&H 57′ Span
10 Ton P&H 78′ Span
10 Ton P&H 87′6″ Span
10 Ton Northern 34′ Span
10 Ton P&H 48′10½″ Span
10 Ton P&H 60′ Span
10 Ton P&H 80′ Span
10 Ton Shaw 68′ Span
10 Ton Shaw 58′ Span
10 Ton Shaw 88′ Span
10 Ton Northern 71′10½″ Span
7½ Ton Erie 70′ Span
7½ Ton P&H 30′6″ Span
7½ Ton Scullin 71′10½″ Span
7½ Ton Shepard 36′ Span
6 Ton Shaw 23′ Span
5 Ton "American" 10′ Span
5 Ton Champion 37′6″ Span
5 Ton Euclid
5 Ton Milwaukee 39′8″ Span
5 Ton Milwaukee 66′9″ Span
5 Ton Milwaukee 70′ Span
5 Ton Northern 49′6″ Span
5 Ton P&H 45′ Span
5 Ton Shaw-Box 25′ Span
5 Ton Shepard 40′ Span
5 Ton Toledo 96′ Span
5 Ton Whiting 80′ Span
3 Ton P&H 46′4″ Span
3 Ton Shaw 33′ Span
3 Ton Whiting 57′3″ Span
2 Ton Detroit 28′ Span
2 Ton P&H 46′4″ Span
2 Ton Shepard-Niles 18′&14′
1½ Ton Cleveland 25′ Span
1½ Ton P&H 34′ Span
1 Ton Curtis 24′ Span

Take advantage of the ECONOMY service by telephoning to us collect, which will enable us to discuss your requirements and present our suggestions.

In addition to overhead cranes we can supply all types of shovels, cranes, draglines, tractors or practically everything in the equipment field. May we have your inquiries?

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49 VANDERBILT AVENUE, NEW YORK 17, N. Y.
Telephones: MUrrayhill 4-2294, 4-2893, 4-2295, 4-2844, 4-2296, 4-8292

BARGAIN
IMMEDIATE DELIVERY

14—24′ Span 2-Ton Cleveland Tramrail Single Girder Type Cranes, with 3 motor floor control, powered with D.C. 230 volt current.

3—22′ 3″ Span 2-Ton Shepard-Niles Two Girder Type Cranes, D.C. 230 volt current; floor operated.

3—31′ Span 2-Ton Yale & Towne Cranes; three way floor controlled; D.C. 230 volt current.

Above all late type—new in 1941 and after—guaranteed. Selling at approximately 50% of new value.

THE W. T. WALSH EQUIPMENT CO.
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CLEVELAND 11, OHIO

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Complete set for the manufacture of a down-draft, magazine, smoke consuming space heater. Also a demonstrator. Address: H. E. Mortimer, 2917 Pestalozzi St., St. Louis 18, Mo.

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One used Clearfield No. 404 sandmixer complete with Master gearhead motor, 5 HP, 220/440 volt, 60 cycle, 3 phase. ADDRESS: THE MACO CORP., HUNTINGTON, INDIANA.

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FOR SALE

Oil fired Porbeck Recirculating Portable Mold Dryer—1,000,000 B.T.U. capacity.
Complete with motor and oil burner.

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For Sale

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IMMEDIATE SHIPMENT

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Tons	Make	Span	Current	Remarks
1 3	Chesapeake	40′0″	220-VAC.	Fl. Op.
1 8	Toledo	51′6″	230-VDC.	Cg. Op.
1 10	Northern	80′0″	220/440-VAC.	Cg. Op.
(WITH 2 5-TON TROLLEYS ON THIS BRIDGE)				
1 15	Shaw	106′8″	230-VDC.	Cg. Op.
1 20	Cleveland	50′0″	230-VDC.	Cg. Op.

MONORAIL ELECTRIC HOISTS

Tons	Make	Current	Remarks
1 ½	Lo-Hed	220-VAC.	Fl. Op.
3 ½	Shepard	230-VDC.	2-motors
1 1	Harrington	A.C. or D.C.	Fl. Op.
1 1	Euclid	110-VDC.	Fl. Op.
4 1	Shepard	230-VDC.	Fl. Op.
1 2	Link-Belt	220-VAC.	Geared Troll.
2 2	Shepard	110-VDC.	Fl. Op.
1 2	Shepard	230-VDC.	Fl. Op.
1 3	Shepard	230-VDC.	Geared Troll.
1 5	Shepard	230-VDC.	2-motors
1 7½	Shepard	230-VDC.	2-motors

(Cg. Op. 40′0″ Lift, Hoist 25/75-FPM., trolley 400-FPM.)

230-VDC. CRANE & MILL MOTORS SERIES

H.P.	Make	Type	R.P.M.
1 2½	G.E.	C.O.-1803 (Comp.)	650
1 5	Westghse	HK-2	850
1 6	G.E.	C.O.-1805	1150
2 6¼	Westghse	K-3	680
1 7½	Westghse	K-4	750
1 7½	G.E.	C.O.-1804	725
1 7/10	G.E.	MD-102 (Back Axle)	1025/800
1 9	G.E.	MD-102 (Back Axle)	975
1 12	G.E.	MD-103	875
1 15	Westghse	HK-5	700
2 15	Westghse	K-6	550
2 11/19	C.W.	B.W. (Back Axle)	675/560
2 30/45	G.E.	MD-104½ (Compd.)	625/500
1 35	G.E.	C.O. 1810	500
1 30/45	C.W.	Size D.W.	620/520
2 42½	Westghse	K-8	910
1 50	G.E.	MD-105	475
2 52	Westghse	K-10 (Back Axle)	740
2 54/80	C.W.	Size F.W.	575/480
1 150	Westghse	RNY-96 (Comp.)	550

Send for our stock list covering 230-VDC. single and variable speed motors, 220/440-VAC. std. and slip ring motors, crane controllers and electric brakes. 1 to 1200-HP. M.G. Sets, etc.

SPECIAL:

1—3-ton Chesapeake 3-motor, Cg. Op., 220/440-VAC. Gantry Crane, 18′11″ bet. legs, 15′6″ overhang each end, REBUILT.

WE OWN AND HAVE ALL THIS EQUIPMENT IN STOCK. IT IS OFFERED REBUILT IN OUR LARGE, MODERN PLANT AND FULLY GUARANTEED.

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PHILADELPHIA 40, PA.

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Ransohoff Water Mill 36 x 60 side loading and end loading. Automatic star separation and star return. Complete with direct drive and in good condition.

BOX 590
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FOR SALE

1—No. 00 Sly Barrel
1—Davenport Rollover
1—Iron Separator, Ladles all sizes
1—Janun Drier Furnace, Foundry Equipment of all kinds.

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1 Detroit Electric Furnace Type LFA Rocking 350# capacity. Complete with panel board and oil circuit breaker. First Class Condition.

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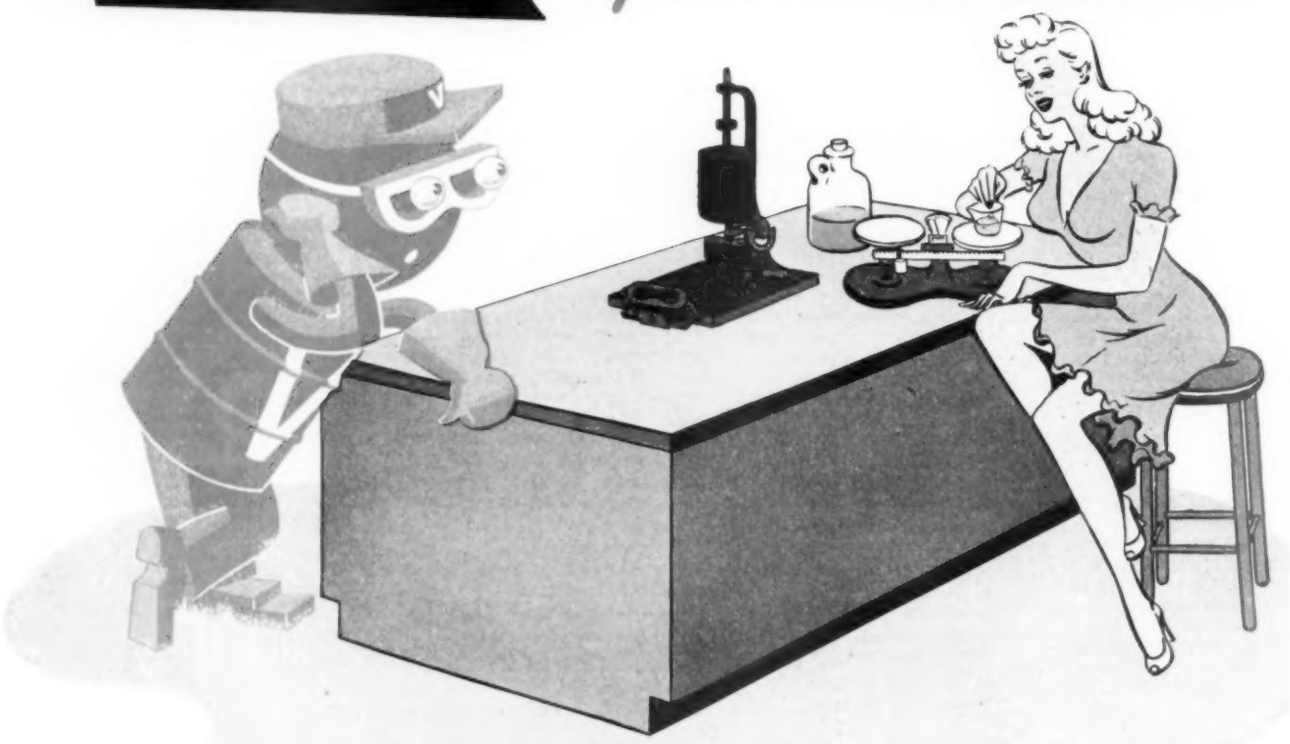
Two (2) Cupolas & Blowers. Capacities six (6) and twelve (12) ton per hour. Address: Box 528, The FOUNDRY, Cleveland 13, Ohio.

We will be happy to welcome you at Booth 1723 in the arena during the Golden Jubilee Foundry Show. May 6-10, 1946.

VELSICOL *light-color Coresin Oils*



GENTLEMEN PREFER BLONDES—

Especially when speaking of Core Oils; foundrymen prefer the light complexioned ones . . . and in VELSICOL CORESIN OILS they get what they want, a light-colored Core Oil that imparts high, fast tensile strength, and properly timed collapsibility to cores for all metals. Light-color Coresin Oils cut down gassing, assure clean shakeout, and reduce to a minimum, that bugaboo of foundrymen, castings rejects. VELSICOL CORESIN OILS are the only light-colored resin-modified oils; only VELSICOL manufactures the light-color hydrocarbon resins with properties to meet the requirements of improved Core Oils. That is why you can depend on absolute uniformity in every drum or tank car of VELSICOL CORESIN OILS; they are the most economical core oils per ton of finished castings that your money can buy. Ask for samples and complete information.

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Foundry Leaders Everywhere

Use Par-Blast
CLEANING ROOMS
FOR
Low Cost Blast Cleaning

Par-Blast Equipment Is Used by the Leaders in Industry

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American Brake Shoe & Foundry Co.
Cadillac Motor Car Co.
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Delco Remy Co.
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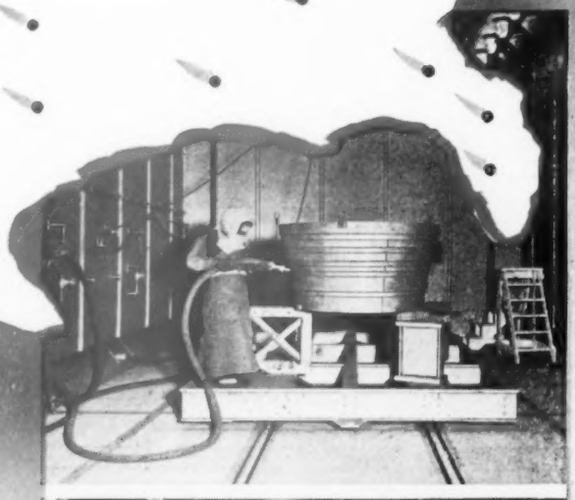
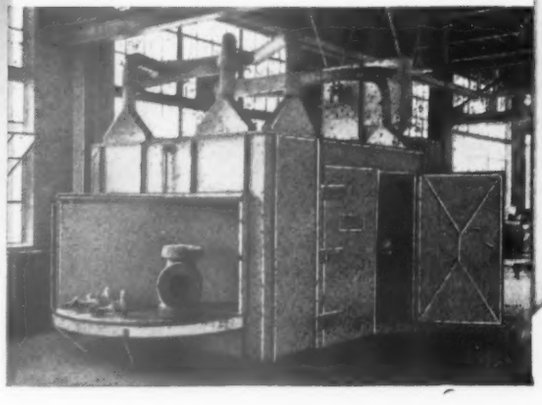




PAR-BLAST ***Cleaning Equipment is backed by over 25 years of creative engineering experience plus practical experience gained from installations throughout the country***

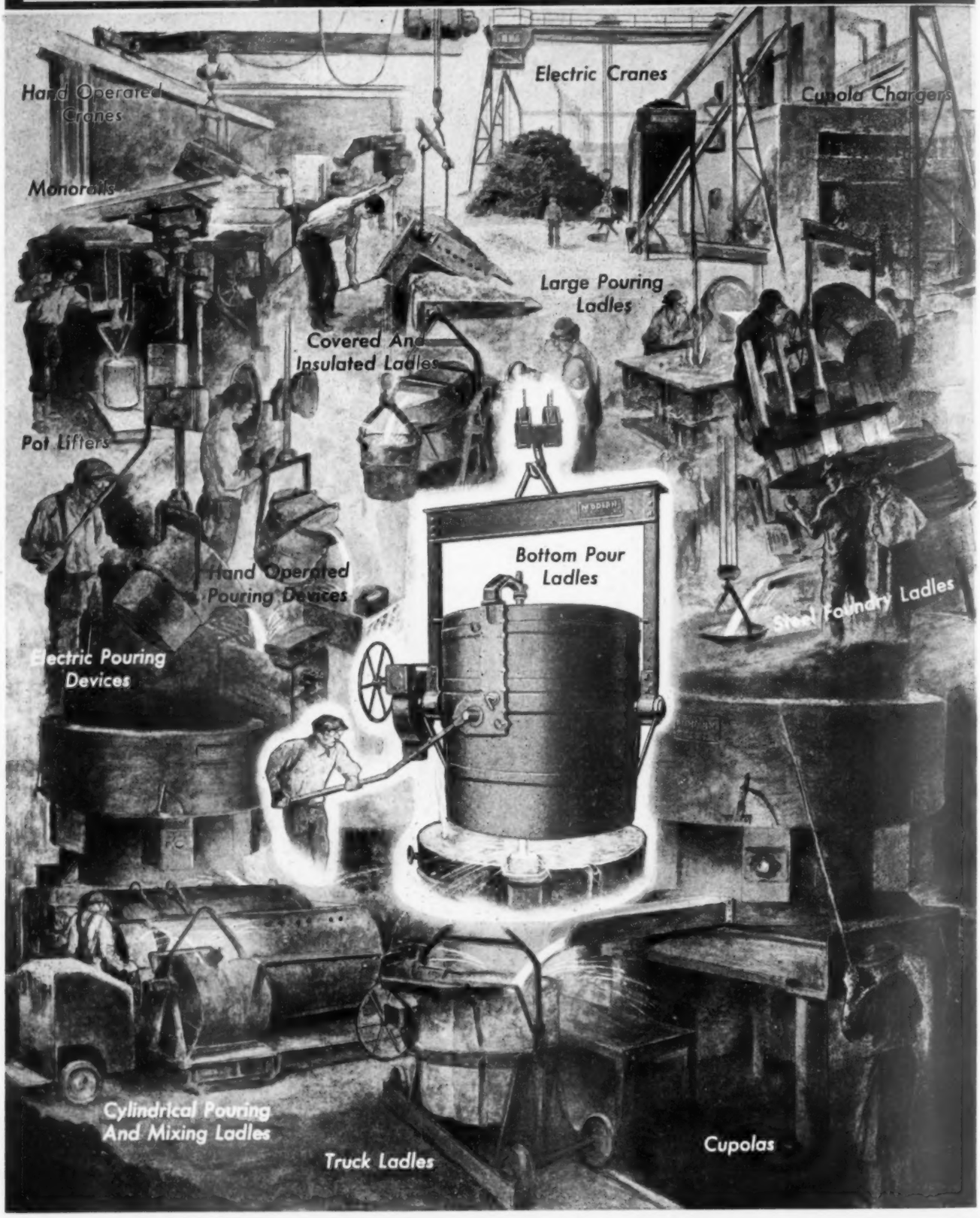
Leaders in the industry use Par-Blast rooms for shot, grit and sandblast cleaning because they do the job quickly . . . efficiently . . . and at a lower cost. Par-Blast rooms are custom designed to handle the specific work or pieces to be cleaned. Turntable, Car and Monorail models are equipped with effective blast tanks . . . efficient abrasive reclaiming units . . . downdraft ventilation and adequate illumination. Walls are heavy steel plate, reinforced and braced for strength and rigidity. Doors are self-closing and self-sealing. Let us analyze and recommend the best type equipment for your plant . . . there's no obligation . . . write today, or send for bulletin No. R-41.

CREATIVE ENGINEERS MANUFACTURERS

Parsons ENGINEERING CORP.

2545 EAST 79th ST. CLEVELAND 4, OHIO

STEEL FOUNDRIES PREFER MODERN IMPROVED BOTTOM POUR LADLES



Cupolas • Cupola Chargers • Lifetime Geared Ladles • Ladles • Electric Cranes
Metal Pouring Systems • Covered & Insulated Ladles • Improved Bottom Pour
Furnace Charging Cranes • Crane & Monorail Systems

MODERN EQUIPMENT CO.
PORT WASHINGTON, WIS.
DEPT. 18-A

STEVENS INCORPORATED
EVERYTHING FOR A FOUNDRY
DETROIT 26 MICHIGAN

6 Stevens Products for Quality Castings

The main objective of our business is to help foundrymen produce QUALITY CASTINGS. The six Stevens Products listed below were developed to do just that . . . at a minimum of labor and cost.

Stevens Core Coatings—tested under actual working conditions—give proper adherence, good suspension, correct penetration, uniform coverage and good heat resistance, characteristics which help materially in producing "QUALITY CASTINGS."

Write and tell us what metal you are pouring—type and size of castings being made, and whether green or dry sand is being used. We will gladly send our recommendations, together with working samples of the Coating best suited to that type of work.

This will in no way obligate you, but, chances are that after you have tried out the sample, you will order Stevens Core Coatings exclusively.

This label on a barrel of Core Coating is a guarantee of Quality

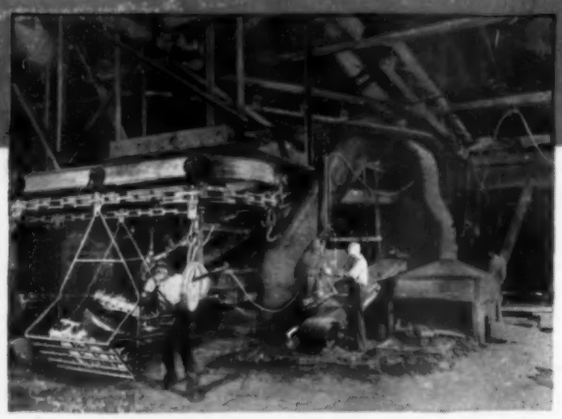
FREDERIC B. STEVENS INCORPORATED

DETROIT 26 MICHIGAN

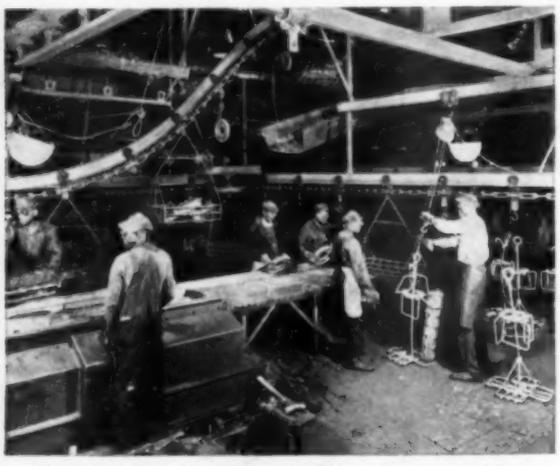
NEW ENGLAND . 166-182 Brewery St., New Haven, Conn.
NEW YORK and PENNSYLVANIA, 93 Stone St., Buffalo, N. Y.
INDIANA . Hoosier Supply Co., 36 Shelby St., Indianapolis, Ind.

• CANADA . FREDERIC B. STEVENS OF CANADA, LIMITED
• 1262 McDougall St. . . . . Windsor, Ontario
• 2368 Dundas St., West . . . . . Toronto, Ontario

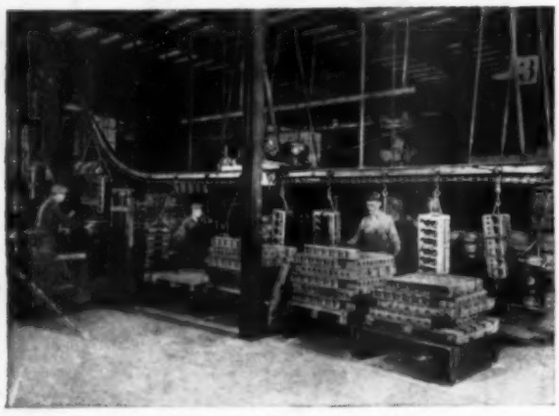
. . how the LINK-BELT TROLLEY CONVEYOR "flows" castings through the Ferro Foundry . . .



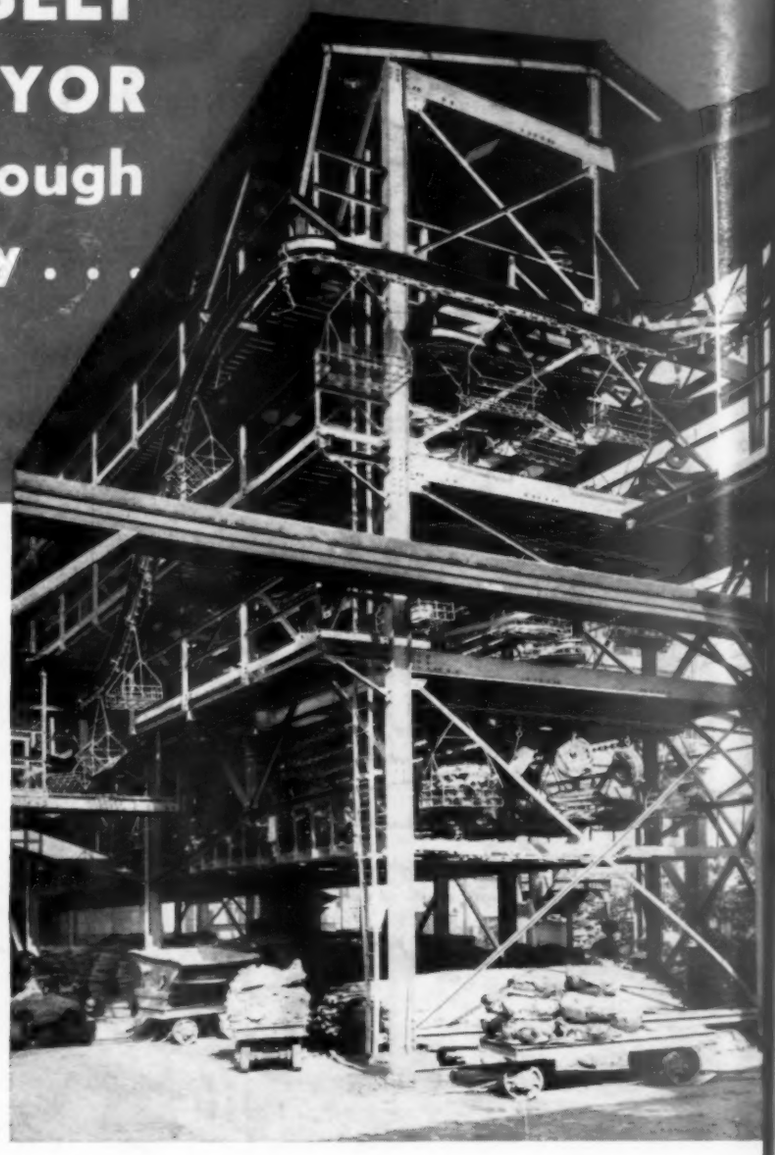
Transferring castings from one of seven shakeouts to castings cooling conveyor.



Transfer point between cleaning room and shipping room trolley conveyors.



The end of the line . . . delivery of castings to shipping room.



• Over 1¼ miles of Link-Belt overhead conveyors are used for handling castings from the various shakeouts thru cooling and cleaning to shipping department at the Ferro Machine and Foundry Company of Cleveland, Ohio. The illustration above shows the cooling tower with the casting cooling conveyor. It is an overhead trolley using Link-Belt drop forged steel heat-treated rivetless chain with ball bearing trolleys spaced every 36 inches, operating on a 6 inch I-beam track. The conveyor is operated at a speed of from 6 to 18 feet per minute by means of three 5 hp variable speed units controlled by a single rheostat. In addition, other Link-Belt overhead trolley conveyors, more than ¼ of a mile in length, handle cores thru preparation to mold conveyors.

Consult Link-Belt materials handling engineers to keep production on the move. Overhead trolley conveyors save floor space, are easy to install and require little power or maintenance.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 2
Los Angeles 33, Seattle 4, Toronto 8.
Offices in Principal Cities.

THE SYMBOL OF QUALITY — LINK-BELT

LINK-BELT CONVEYORS

AND PREPARATION MACHINERY

MANUFACTURER'S ASSOC. FOUNDRY EQUIPMENT